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Technologies for the Preservation of Prehistoric & Historic Landscapes

Background Paper

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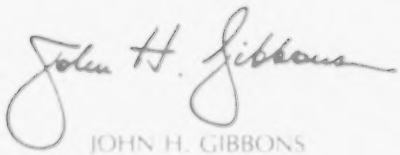
Foreword

In recent years, the American public and Congress have become much more aware of the value of historic landscapes as teachers and guides to America's heritage. Interest in preserving landscapes for the enjoyment and education of future generations extends well beyond saving historic battlefields and the grounds of historic houses, and now encompasses such varied cultural landscapes as the Pinelands of New Jersey, the historic courtyards of Arizona, tobacco farms in Kentucky, and the historic parks and gardens of landscape architects. These and other historic landscapes in every State of the Union reflect the exciting cultural diversity of rural and urban America.

As this background paper shows, the implementation of Federal historic preservation laws with respect to historic landscapes lags far behind the effort expended on historic buildings and archaeological sites. For example, to date, no one has inventoried the many gardens, parks, and other historic landscapes designed by the well-known firms of Frederick Law Olmsted and his associates. Yet these landscapes, which grace most major U.S. cities, stand out as prime examples of American design and cultural values. The desire to rectify this situation has led to congressional consideration of a specific bill, the Olmsted Heritage Landscapes Act of 1987, which is discussed and analyzed in this background paper.

Because landscapes are always living, growing, and dying, they are highly vulnerable to environmental changes, from both human and natural agents. This background paper illustrates the importance of continuing to apply certain high leverage, cost-effective technologies, such as remote sensing and computer hardware and software, if this Nation wishes to protect, restore, and preserve important parts of its rich heritage for future generations of Americans.

In undertaking this work, OTA sought the contributions of a wide spectrum of knowledgeable and interested people within Federal and State governments and the private sector. Some provided information and guidance, others reviewed drafts of this background paper. OTA gratefully acknowledges their contributions of time and intellectual effort.



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NOTE: OTA appreciates and is grateful for the valuable assistance and thoughtful critiques provided by the workshop participants. The workshop participants do not, however, necessarily approve, disapprove, or endorse this report. OTA assumes full responsibility for the report and the accuracy of its contents.

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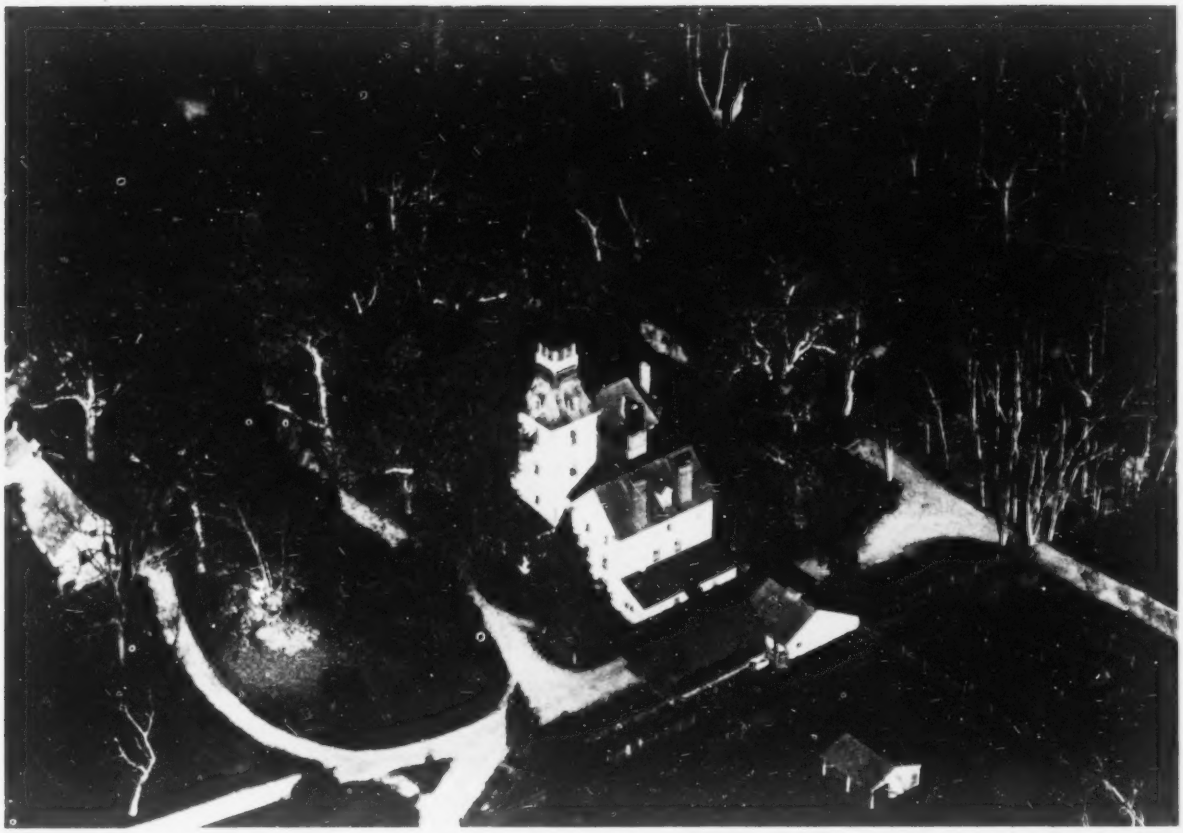


Photo credit: Joseph Czarnecki

A preserved iron plantation at Batsto, New Jersey, in Wharton State Forest.

INTRODUCTION

This background paper, which was requested by the House Committee on Interior and Insular Affairs,[1] identifies and examines the principal technological issues related to the identification and preservation of prehistoric and historic landscapes. It extends the general assessment of *Technologies for Prehistoric and Historic Preservation*[2] released by the committee in 1986.

Debate over the Olmsted Heritage Landscapes Act of 1985,[3] which passed the House but not the Senate during the 99th Congress, brought to light numerous questions related to technologies and the preservation of historic designed landscapes. This background paper explores several important issues raised in that debate and places them in the overall context of prehistoric and historic preservation. It emphasizes technological issues related to the identification, analysis, and evaluation of prehistoric and historic landscapes.

The background paper derives principally from a workshop convened by OTA on February 27-28, 1986, which met to discuss the range of issues in the preservation of landscapes. OTA also received additional material from review comments on a draft summary of that workshop, staff research, personal interviews with landscape professionals from a variety of disciplines, and from an informal meeting on landscapes held at OTA, November 13, 1986.

The February 1986 workshop identified and examined technologies for discovering, surveying, analyzing, interpreting, and protecting both prehistoric and historic landscapes. It discussed the benefits and limitations of available technologies and suggested new ones that could be applied to the preservation of these important cultural resources.

Some of the material in this background paper appeared in *Technologies for Prehistoric and Historic Preservation* in different form and organization. That comprehensive report considered technologies for the preservation of archaeological sites and historic structures, as well as prehistoric and historic landscapes. The reader may refer to OTA's previous report for a general overview of the issues common to all preservation disciplines, as well as to landscape concerns not dealt with herein. In both papers, preservation technology refers broadly to any equipment, methods, and techniques that can be applied to the discovery, analysis, interpretation, restoration, conservation, protection, and management of prehistoric and historic structures, sites, and landscapes.

This background paper is organized according to three broad categories: 1) discussion of the primary problems or issues that face landscape preservation; 2) identification of the tools for addressing these issues; and, finally, 3) exploration of policy options for putting technologies to work.

In many circumstances, attempting to define and interpret the prehistoric cultural landscape is an important component of studying prehistoric sites and societies. Certain prehistoric landscapes may also play an important part in local history. However, for reasons of clarity and simplicity, in the balance of this background paper we have reduced the cumbersome term "prehistoric and historic landscapes" to the simpler one, "historic landscapes." Thus, when we refer to historic landscapes, unless the context clearly indicates otherwise, we generally also mean prehistoric landscapes. Some landscapes, prehistoric as well as historic, can be considered to be a subset of the larger class of archaeological sites.

[1] Letter of Oct. 8, 1986, signed by Representatives Morris K. Udall and John F. Seiberling.

[2] U.S. Congress, Office of Technology Assessment, *Technologies for Prehistoric and Historic Preservation* OTA-E-319 (Washington, DC: U.S. Government Printing Office, September 1986).

[3] H.R. 37.

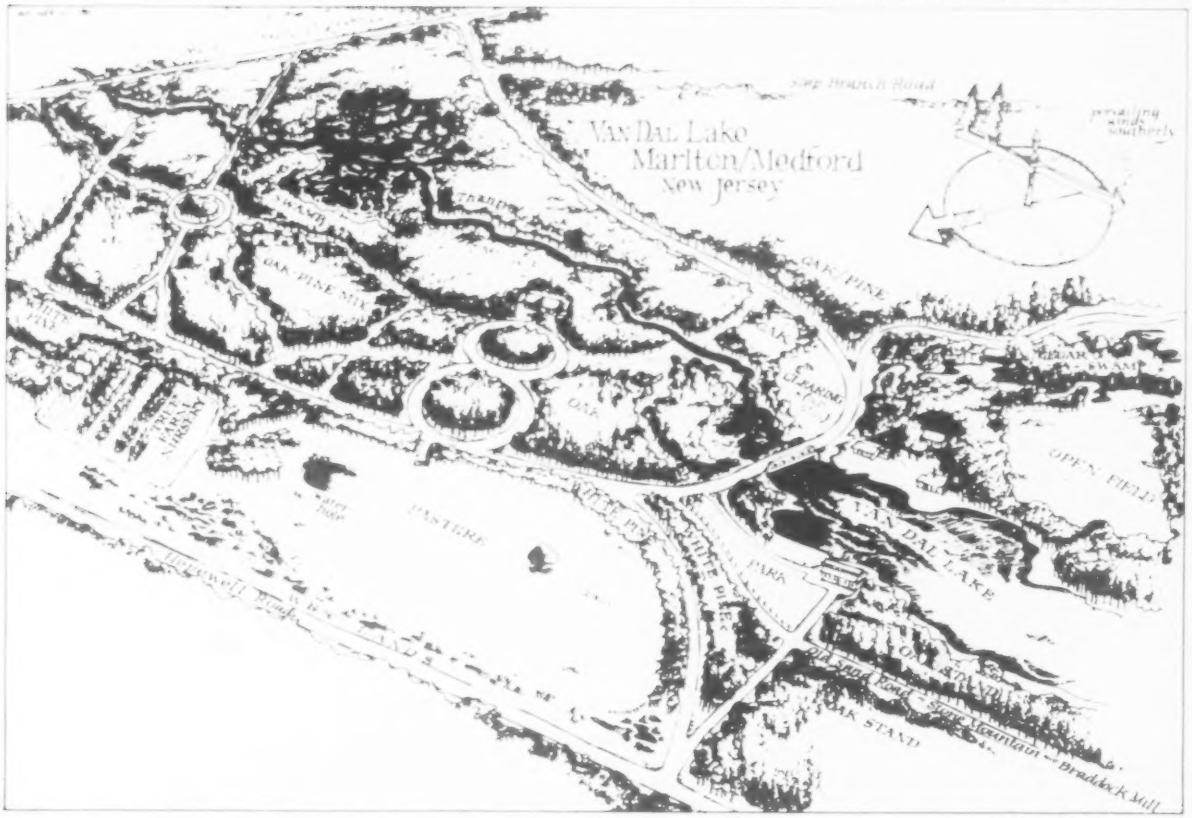
PRINCIPAL FINDINGS

The international preservation community focused its efforts on preserving and protecting historic landscapes only in relatively recent years. Yet historic landscapes play an important part in our understanding and appreciation of U.S. national heritage. Participants in the OTA assessment urged that U.S. preservation policy explicitly and publicly acknowledge the importance of U.S. historic landscapes so the value of preserving and restoring them becomes more widely appreciated. Establishing preservation values will assist in protecting landscapes from a wide variety of natural and human threats. However, implementing many of the policy options presented in this background paper would likely require increased funding, as the available resources for historic preservation at both the Federal and State levels are currently stretched and allow for little flexibility to add new tasks.

The management and preservation of landscapes is complicated by the fact that they contain a wide variety of elements, including plants and structures as well as landforms. However, a variety of technologies exist to assist in identifying, assessing, conserving, and protecting landscapes. These findings illuminate the technological and institutional issues related to the use of technology for preserving landscapes. They summarize issues and concerns discussed in detail in the remainder of this background paper.

More consistent landscape terminology, and guidelines for applying preservation standards, could strengthen the identification and preservation of significant historic landscapes.

In part because "landscape" is a general term, applied to many different landscape types, but also because it may imply a wide variety of mean-



Drawing by: Jan Adkins

Buildings and firebreaks (pasture, garden, roads, and streams) are positioned with respect to the prevailing wind, affording maximum protection against fires coming from the central woodlands during fire season.

ings, the identification of historic landscapes has been impeded by a lack of consistent terminology. Some landscapes are historically significant and are appropriate targets of preservation efforts. An essential first step in determining historic significance is the identification of the type of landscape under consideration.

The National Park Services (NPS) has recently established definitions for various types of landscapes to guide the nomination of landscapes to the National Register. In addition to defining historic designed landscapes, and setting guidelines for evaluating them, NPS has focused attention on the category of cultural landscape it refers to as the ***rural historic district***. Yet, other historic landscapes, such as components of the Pinelands of New Jersey, have their own distinctive characteristics and are an important component of cultural landscapes. They also need to be inventoried as landscapes, where appropriate, and their historic significance determined.

Passage of the Olmsted Heritage Landscapes Act of 1987 (H.R. 17) could materially aid the collection of information on all U.S.-designed historic landscapes.

By focusing attention on the many landscape projects designed by Frederick Law Olmsted and his professional successors, the Olmsted Act could increase awareness of the importance of historic landscapes to the Nation's history. Some private owners of Olmsted properties have expressed fear that passage of such an act would limit their ability to control disposition of these properties. However, H.R. 17 seeks primarily to inventory Olmsted properties designed by the Olmsted firms, and would not limit the property rights of private owners.

One of the major impediments to preserving significant landscapes is the poor state of knowledge of the Nation's historic landscapes.

Inventory or survey of landscapes is a crucial first step in preserving them. However, not all historic landscapes can be preserved, for not all are historically significant. Until recently, the Federal government has expended little effort to identify and document nationally significant landscapes; no comprehensive, centralized listing of significant American landscapes exists.

A comprehensive national historic landscape survey would draw together the information we now have on historic landscapes and identify those missed in previous, haphazard efforts. The search might begin with a national survey of designed historic landscapes as an important first step, because greater agreement exists among professionals concerning what constitutes a designed landscape than on the broader definitions.

Another approach might utilize an intensive regional survey of all types of historic landscapes, which could assist the historic preservation community in developing techniques and methods to locate and evaluate significant historic landscapes. However, no substantial progress in identifying and preserving historic landscapes is likely to occur unless Congress appropriates additional funds for landscapes.

A variety of technologies are available for gathering and analyzing landscape information:

Archival and library information systems. A vast amount of primary and secondary information about designed landscapes and urban cultural landscapes is already available in the Nation's depositories. New information technologies can make access more efficient.

Computer aided-design (CAD). CAD software and hardware make it possible to draw and store a given landscape within the computer memory, and to manipulate and alter the drawing.

Computer-aided survey. Computers can increase survey accuracy and reduce overall labor, especially when inexpensive, portable computers are used in the field.

Geographic information systems (GIS). These computerized spatial database systems are designed to integrate, manipulate, and analyze statistical, demographic, cultural, and natural resources data. GIS are also capable of printing maps and reports encompassing a wide variety of spatial information.

Landscape databases. Computerized databases of various kinds are crucial to the efficient development and use of landscape information. As computers and software have become increasingly more capable, and cheaper to acquire, many users have begun to develop their own powerful databases.

Measured drawings. This technique, borrowed from architecture, can be used to document a landscape thoroughly for later analysis and evaluation.

Photography and videogrammetry. Photography and videogrammetry are powerful methods for documenting a variety of historic resources, including landscapes. Stereophotogrammetric methods that use a photo-theodolite enable detailed landscape documentation in three dimensions.

Remote sensing technologies. Remote sensing techniques, especially those used from the perspective of aircraft and spacecraft, hold great promise for the study of historic landscapes because they are nondestructive and capable of recording and analyzing vast areas quickly and accurately.

The greatest threat to historic landscapes is destruction, by ignorance or intent. The application of appropriate technologies could make a significant difference in improving the preservation of significant historic landscapes.

Historic landscapes are susceptible to a variety of human and natural threats that can destroy or significantly alter their historic character. In order to make informed decisions concerning the

Photo credit: (Aerial photo by Dache M. Reeves, Jan. 20, 1934. Courtesy of Smithsonian Institution National Anthropological Archives).

Serpent Mound in modern farm landscape, south-central Ohio. Designed and built by the Adena culture, which flourished in the first millenium B.C., this is an unusual example of thousands of earthworks found throughout the Central and Southeastern United States.

multitude of cultural resources under their care, managers need to have an increased awareness of the value of historic landscapes, and the skills needed to study, identify, evaluate, conserve, and manage them. Therefore, managers need better access to landscape information and training. However, considerably more effort will be required to enable managers to put technology to better use in landscape management.

A federally funded facility that would focus on the research and development of preservation technology could make a major contribution to the study and preservation of historic landscapes.

Participants in the OTA assessment, *Technologies for Prehistoric and Historic Preservation*, cited the critical need for a federally supported facility for preservation technologies. A center would foster the research and development of advanced technologies, train professionals in their use, develop technical standards, disseminate accurate technical information, and promote public education about historic preservation. Although the private sector has a significant role in developing and using preservation technologies, the Federal government has the lead responsibility for guiding preservation efforts throughout the United States.

In order to assist the Federal Government in transferring useful technologies from natural sciences and engineering into preservation, and developing new cost-effective technologies, Congress may wish to establish such a federally chartered center. Congress could mandate the establishment of a Federal Center for Preservation Technology within the Department of Interior or other Federal agency. Alternatively, Congress could create a National Center for Preservation Technology, managed by a consortium of universities and preservation organizations. Such an institution would be able to draw on a multitude of different skills in several universities, and in many university departments. If a Center for Preservation Technology were established, landscape preservation concerns could constitute a significant portion of the center's workload.

Although a center for preservation technology would tackle a number of different technological areas, the following items are likely candidates for part of the center's agenda:

1. *Intensive regional survey of landscapes*: A center could fund and supervise the development of methods for conducting intensive local and regional surveys. They would have numerous benefits for historic preservation, as well as local and regional planning efforts.
2. *Horticultural or Botanical Technologies*: Authentic restoration and conservation of historic landscapes depends on the ability to identify, locate, and use historically appropriate plants. A center could contribute to research on historical plants.
3. *Clearinghouse for landscape preservation information*: The preservation of historic cultural resources, including landscapes, depends substantially on the use of a variety of historical records and technical information. One of the most important functions a center could have is to serve as a source, or clearinghouse of historical and technical preservation information, including information on landscape preservation.
4. *Landscape management and maintenance techniques*: Periodic maintenance is one of the most effective means of preserving a historic landscape. A center could conduct research on automated methods for improving maintenance management.
5. *Public education*: Public education is one of the keys to improved historic preservation. A center could translate research results into information the public can comprehend and use.

A Coalition for Applied Preservation Technology (CAPT) has recently been formed whose membership is composed of a variety of private preservation organizations. CAPT is devoted to establishing a multidisciplinary National Center for Applied Preservation Technology.

Technology can assist the development of methods for systematic and long-term maintenance of landscapes, which is one of the most effective means of slowing deterioration from human and natural agencies.

Systematic preventative maintenance and upkeep are essential to the conservation of a landscape, particularly because landscapes change so rapidly as a result of plant growth, or stresses to the landscape. Increased use of personal computers and specially designed software could be extremely helpful in improving the quality and quantity of landscape maintenance.

Improved identification and preservation of historic landscapes depend on achieving greater public understanding of the reasons to preserve historic landscapes. In order to enhance public appreciation of historic landscapes, Federal, State, and local governments, as well as the private sector, will have to reach a wider audience.

Citizens are often unaware of the value and significance of historic landscapes. Traditionally, historic preservationists have worked from the grassroots, first by building local constituencies and then through them identifying the value of a given structure or archaeological site and finally seeking State or National help in preserving it. However, local groups who might identify landscape value often do not exist, in part because they lack adequate information about why certain landscapes might be important to our cultural history. Often, those who are most familiar with a landscape are least aware of its wider national value.

Federal agencies, especially NPS, could enhance the public's understanding of the historic importance of certain landscapes by including interpretive material on landscapes in the interpretative presentations park personnel give to the millions of visitors each year.

A national database of identified historic landscapes would substantially assist the identification of other, uncataloged historic landscapes.

At present, the United States has no national database of historic landscapes. State and local databases are also highly incomplete and lack information on location of records and landscapes. The private effort of the American Garden History Program at Wave Hill, Bronx, NY, to develop a Catalog of Landscape Records in the United States will be an important first step in developing a national database. Private efforts such as this would benefit from the involvement of the National Park Service and other Federal agencies concerned with historic landscapes.

In order to improve the preservation of prehistoric and historic landscapes, it would be necessary for the National Park Service and other Federal agencies to focus more consistent attention on landscape preservation in their management of cultural resources.

Because the National Park Service (NPS) serves as the lead agency for technical preservation matters for the Federal Government, and for State and local efforts, NPS administrators and managers need to be more aware of the value of preserving prehistoric and historic landscapes. NPS could assist by developing uniform standards for landscape identification and preservation; expanding the subject matter of its publications to include recommendations on studying and preserving historic landscapes; enhancing its own landscape preservation effort; developing a self-study course on landscape preservation; and by upgrading and highlighting the importance of gardening and grounds maintenance jobs.

NPS, together with other Federal agencies, could aid in the identification and preservation of significant historic landscapes by clarifying landscape terminology in the National Register, improving interagency information flow concerning historic landscapes, and generally focusing more attention on landscape preservation.

NPS could also assume a stronger role in the effort, initiated by the American Society of Landscape Architects (ASLA), to complete a national survey of designed landscapes. Specifically, the ASLA needs assistance in completing the survey in a timely manner, acquiring consistent information, and standardizing the information collected.

NPS could also expand the training it provides to State and local preservation agencies and groups on landscapes. In particular, the States could benefit from access to information on carrying out landscapes surveys.

Although the *National Historic Preservation Act* contains no impediment to the identification and preservation of landscapes, neither does it specifically mention them. Most Federal agencies that hold and manage historic properties nonetheless also manage historic landscapes. Not expressly mandating in the law that historic landscapes are worthy of being identified and preserved may allow Federal agencies to overlook landscape concerns in their preservation programs.

Some observers have suggested that it may be appropriate to amend the National Historic Preservation Act to include explicit reference to historic landscapes. Others have expressed concern that including explicit reference to historic landscapes will open the act to inclusion of other, more specific historic categories, or will subject the *National Historic Preservation Act* to unnecessary and harmful experimentation. Congress may wish to address the need for greater attention to landscape concerns by designing additional legislation which recognizes the role historic landscapes play in the history of this country and specifically directs Federal agencies to include landscape concerns in their preservation programs. Alternatively, Congress may wish to use its oversight authority to encourage the inclusion of landscape concerns in the regulations and guidelines issued by Federal agencies that treat prehistoric and historic preservation.

Tax credits and incentives for the preservation of historic landscapes might be effective in enhancing the preservation of historic landscapes.

Tax incentives have provided an incalculable boost to the preservation of income producing, privately owned, historic structures. Yet, current legislation permits historic preservation tax credits for buildings only. Congress could institute a similar set of tax incentives for historic landscapes. Tax incentives would also increase public awareness of these threatened historic resources. Congress may wish to consider new legislation to address this need.

The States' approaches to landscape issues are very uneven; only a few States have made significant strides in identifying their historic landscapes.

State Historic Preservation Offices should be encouraged to inventory their historic landscapes and to maintain surveys on computer databases so they can be enlarged and corrected frequently and cost effectively. To be most effective for preservation purposes, such databases should be developed with standard formats. The State offices depend heavily on the Historic Preservation Fund to support their activities. Additional funding will be needed to support inventory of historic landscapes.

LANDSCAPE PRESERVATION

Whether or not we are directly aware of their influence, landscapes have a profound effect on human life. The aesthetic, economic, and security values of our physical surroundings play essential roles in decisions about where and how we live. Some societies and individuals regard certain landforms as sacred. As a result, societies have both altered their physical surroundings and been altered and affected by them. The result of such interaction is a landscape.[4]

Whether they are highly structured parks and formal gardens, or less structured farms, urban landscapes, or "roadscapes", historic landscapes reflect U.S. cultural heritage. Yet, as one historian has noted:

> Historians have been tardy in recognizing that the environment, natural and man-made, is an amazing historical document. In our teaching, we have not adequately explored the ways in which, rightly seen, a landscape reveals as much of a society's culture as does a novel, a newspaper, or a Fourth of July oration.[5]

[4]Carole L. Crumley, "An Archeological Reconnaissance at Mont Dardon, France," *Archaeology*, May/June 1983, pp. 14-17. See also Tony Hiss, "Experiencing Places I," *New Yorker*, June 22, 1987, pp. 43-68; "Experiencing Places II," *New Yorker*, June 29, 1987, pp. 73-86.

[5]Thomas J. Schlereth, *Artifacts and the American Past* (Nashville, TN: American Association for State and Local History, 1980), p. 147.

Photo credit: National Park Service, National Register of Historic Places

Bishop Hill Historic District, National Historic Landmark, Bishop Hill, Illinois.

In a way, landscapes are the context of life, for the form of our landscapes embodies our material culture and our ideals.[6] For example, although visitors to historic buildings, such as Virginia's Gunston Hall, the home of George Mason, tend to focus on the building and its interior appointments, the appearance of the surroundings, including various outbuildings, fences, and other structures, as well as plantings, contributes significantly to their understanding of the building's historical context.

Compared to the efforts to preserve historic structures, only relatively recently has the international preservation community focused its efforts on preserving and protecting historic landscapes.[7] As one report expressed it:

> It seems . . . that an old landscape must still, somehow, be useful: it must be a teacher, a guide, a place for recreation, or a place of contact with the past. Establishing such usefulness requires a great effort, a lot of subjective suggestion, considerable ingenuity—and will have to be backed by more research.[8]

However, in the United States, the term "landscape" does not even appear in the formal listing of categories of sites that are eligible for nomination to the National Register of Historic Places (National Register).[9] Most National Register landscapes are there as a result of their association with other categories such as a building, district, or site. In other cases, a building may be included but the surrounding landscape, which may even have greater historic significance, might not be recognized or described. Very few landscapes have been nominated as a consequence of having significance as historic landscapes.[10] Only in 1986 did the National Park Service (NPS) develop and publish a set of guidelines for nominating historic *designed* landscapes to the National Register.[11] Other categories of landscapes have not been fully examined by NPS.

In some respects, the management and preservation of landscapes is more complicated than historic structures because landscapes encompass a greater variety of elements, and include plants and structures as well as landforms. But more important, natural elements of landscapes are particularly susceptible to alteration and deterioration. Unlike historic structures, plants and trees grow too large or spread to other areas. In time, water may erode the soil and improper pruning and care may enhance potential damage from disease and pests. Because they are "so rooted in process," landscapes are highly vulnerable.[12] New agricultural practices, for example, can dramatically alter the look of the rural landscape.[13] Changing agricultural economics, such as the move from the predominance of family farms to agribusiness, alter both traditional patterns of the land and the ways of life that produced the patterns. Contemporary landscapes, while different, exhibit their own appeal.

The discovery and identification of U.S. historic landscapes is still in its infancy. In part as a result of a general lack of awareness of the value and vulnerability of landscapes, the constituency for locating and preserving significant historic landscapes has not yet developed fully, though it is growing. Table 1 lists some of the organizations that are especially active in landscape preservation.

[6]Marilyn Nickels, National Park Service, personal communication, 1987; see also D.W. Meining, *The Interpretation of Ordinary Landscapes* (Oxford England: Oxford University Press, 1979).

[7]See the discussion in W.H. Tishler, "The Landscape: An Emerging Historic Preservation Resource," *The Association for Preservation Technology Bulletin* 11, No. 4, 1979, pp. 9-26. See also UNESCO, "Recommendation Concerning the Safeguarding of the Beauty and Character of Landscapes and Sites," adopted by the General Conference at its Twelfth Session, Paris, Dec. 11, 1962, for a relatively early attempt to define landscape preservation values.

[8]State of New Mexico, "First Annual Report, Registry of Historic Landscapes," Historic Preservation Bureau, 1982, p. 6.

[9]"How To Apply the National Register Criteria for Evaluation" (Washington, DC: U.S. Department of the Interior, National Park Service, June 1984).

[10]Lisa A. Kunst and Patricia M. O'Donnell, "Historic Landscape Preservation Deserves a Broader Meaning," *Landscape Architecture*, January 1981, p. 53.

[11]See J. Timothy Keller and Genevieve P. Keller, "How To Evaluate and Nominate Designed Historic Landscapes," *National Register of Historic Places Bulletin* 18, for a discussion of types of designed landscapes.

[12]Catherine M. Howett, "Landscape Research: Keeping Faith With Today and Tomorrow," *The Yearbook of Landscape Architecture: Historic Preservation* (New York: Van Nostrand Reinhold, 1983), p. 3.

[13]Orlando Ridout, V, "Agricultural Change and the Architectural Landscape," *3 Centuries of Maryland Architecture* (Annapolis, MD: Maryland Historical Trust and the Society for the Preservation of Maryland Antiquities, 1982), pp. 3-7.

Table 1.—Organizations Active in Landscape History and Preservation

Alliance for Historic Landscape Preservation
American Association for State and Local History (AASLH)
American Folklife Center
American Folklore Society
American Rock Art Research Association
American Society of Landscape Architects (ASLA)
American Studies Association
Association of Living History Farms and Historic Museums
Association for Preservation Technology (APT)
National Association for Olmsted Parks
National Council on Public History
National Park Service
Organization of American Historians
National Trust for Historic Preservation
Society for Architectural Historians, Chapter for Landscape Architecture and the Allied Arts
Trustees of Reservations (Massachusetts private conservancy)

SOURCE: Office of Technology Assessment, 1987

The legislative activity surrounding the efforts in the 99th Congress to pass the Olmsted Preservation Act, which sought to "encourage the identification, preservation, and commemoration of historic designed landscapes," reflects increased interest in landscape preservation in the Congress. In part such interest has been sparked by the limited survey of Olmsted landscapes by the National Association of Olmsted Parks, and by State landscape inventories. For example, the State of Massachusetts has begun an inventory of its Olmsted parks and other designed landscapes.[14] The States of Ohio[15] and New Mexico[16] have also initiated inventories of their historic landscapes. Finally, within its Park Historic Architecture Division, NPS has instituted a limited effort to coordinate NPS efforts in landscape preservation and to initiate several landscape preservation projects.

[14]Eleanor M. Peck, Keith Morgan, and Cynthia Zaitzevsky (eds.), *Olmsted in Massachusetts: The Public Legacy* (Brookline, MA: Massachusetts Association for Olmsted Parks, 1983); Charles E. Beveridge, Carolyn F. Hoffman, Shary Page Berg, and Arleyn A. Levee, "The Master List of Design Projects of the Olmsted Firm in Massachusetts, 1866-1950," Massachusetts Association for Olmsted Parks, Boston, MA, 1986.

[15]Ohio Historic Landscapes Survey, manuscript and survey form distributed by the Ohio Historical Society, Columbus, OH, n.d.

[16]Baker H. Morrow, "Old Landscapes, New Ideas: New Mexico's Historic Landscape Architecture," *New Mexico Architecture*, September-October 1985, pp. 11-17.

MAJOR ISSUES

Participants in this study identified the following issues that need to be addressed in developing a sound and well-considered Federal policy toward landscape preservation. Technology concerns permeate these issues. Because most of these issues are interrelated, they are not necessarily listed in rank order.

ISSUE A: ***The lack of consistent landscape terminology and guidelines for applying preservation standards have impeded the identification and preservation of significant historic landscapes.***

One of the difficult, but important, tasks facing landscape preservationists is to arrive at standard definitions that can be used in a common vocabulary. Among other things, a set of standard definitions would enhance the ability of local individuals and groups to develop nominations to State historic registers and to the National Register. It would facilitate interdisciplinary approaches to their location, study, and evaluation.

The English term "landscape" was originally introduced as a technical term of painters and referred to the representation of "natural inland scenery."[17] Later, it acquired a much broader set of meanings, and came to be understood primarily as "shaped land, land modified for permanent human occupation, for dwelling, agriculture, manufacturing, government, worship, and for pleasure."[18] Table 2 presents a list of categories of historic landscapes.

Although different landscapes exhibit distinct characteristics, because landscapes may lack clear boundaries and include structures and sites as well as natural components, landscape values may appear elusive, making precise and common, or standard, definitions difficult to achieve in practice. In general parlance, we often use landscape in the broadest sense to mean environment (including both natural forms and those achieved by art). However, landscapes are often considered simply the ambiances of structures, as when we speak of "landscaping a building." In that sense, landscapes are then thought of as equivalent to nature, in spite of the fact that in order to achieve such a landscape, the natural forms must be molded to a plan. In the eyes of many observers, President Jefferson's home, Monticello, is a historic landscape of which the central building is the most important part. Others consider only the form and structure of the house and ignore its setting. Adding to the difficulty is the fact that specialists in different disciplines tend to impart different meanings to the term "landscape," according to the established practices of their disciplines and the context of the landscape. For example, as noted below, the landscape architect might see the landscape as a design statement,[19] while the folklorist might experience the same landscape in terms of what it conveys about the folk practices of the landscape's inhabitants.[20]

[17]*The Compact Edition of the Oxford English Dictionary* (Oxford, England: Oxford University Press, 1971), p. 1566.

[18]John R. Stilgoe, *Common Landscape of America, 1580 to 1845* (New Haven, CT: Yale University Press, 1982).

[19]Robert W. Leech, "The First Dilemma," *Landscape Architecture* 77, 1977, pp. 62-65.

[20]For example, see the treatment of landscape in Mary Hufford, *One Space, Many Places: Folklife and Land Use in New Jersey's Pinelands National Reserve* (Washington, DC: American Folklife Center, Library of Congress 1986); or Rita Zorn Moonsammy, David Steven Cohen, and Lorraine E. Williams (eds.), *Pinelands Folklife* (New Brunswick, NJ: Rutgers University Press, 1987); or M. Jane Young, *Signs From the Ancestors: Zuni Perceptions of Rock Art* (Albuquerque, NM: University of New Mexico Press, in press).

Photo credit: National Park Service, Historic American Buildings Survey, Jet Lowe, Photographer, April 1984

Overall view of planned communal gardens looking east, Locke, California. Locke is a small, rural Chinese community on the Sacramento River. It was developed in the early 20th century to serve Chungshan Chinese laborers who worked in the fruit orchards and vegetable fields in California's Delta region. It is the only extant rural Chinese community still occupied by Chinese people.

Table 2.—Categories of Historic Landscapes

	Treatment					
	Restoration	Rehabilitation	Reconstruction	Interpretation	Conservation	Typical landscape preservation projects
Residential grounds	✓		✓	✓		Mary Washington House, Fredericksburg, VA GWSM, Inc. The Garden Club of Virginia
Monument grounds	✓	✓		✓		Statue of Liberty, New York, NY Norman T. Newton National Park Service
Public building grounds	✓	✓				Original Governor's Mansion, Helena, MT Richard E. Mayer Montana State Parks Division
Garden	✓	✓	✓			Stratford Garden Restoration, Potomac River, VA GWSM, Inc. The Garden Club of Virginia
Minor public grounds (e.g., town square, parklet, traffic circle)	✓			✓		Pioneer Square, Seattle, WA Jones & Jones City of Seattle
Botanical garden	✓	✓			✓	Sannonburg Gardens, Canandaigua, NY Noredo A. Rotunno Sannonburg Gardens Committee
Fort	✓	✓		✓		Fort Stanwix National Monument, Rome, NY Dureya & Wilhelmi, P.C. National Park Service
Battlefield		✓		✓	✓	Rosebud Battlefield, Montana Richard E. Mayer Montana State Parks Division
Cemetery		✓			✓	Cemeteries, New Harmony, IN Kane & Carruth, P.C.
Streetscape		✓		✓		Main Street Project, Hot Springs, SD Preservation/Urban/Design, Inc. National Trust Chicago Mid-West Office
Estate	✓	✓			✓	Gamble Plantation, Manatee County, FL Lane L. Marshall & Associates, Inc. State of Florida
Park		✓		✓	✓	Cherokee Park Restoration, Louisville, KY Johnson, Johnson & Roy, Inc. Louisville Metropolitan Park & Recreation Board
Working farm	✓		✓			Old World Wisconsin, Eagle, WI William H. Tishler State Historical Society of Wisconsin
Museum village	✓	✓	✓			Williamsburg, VA Shurcliff, Hopkins, Parker, Barton & Belden—Staff Landscape Architects Colonial Williamsburg Foundation
District	✓			✓	✓	Heritage Square, Los Angeles, CA Merrill W. Winans Cultural Heritage Foundation
Town		✓		✓	✓	Town of New Harmony, New Harmony, IN Kane & Carruth, P.C.
Prehistoric site				✓	✓	Cahokia Mounds, near East St. Louis, IL Edward J. Keating Illinois Department of Conservation
Park system		✓		✓	✓	Survey Olmsted Parks System, Buffalo, NY Patricia M. O'Donnell Highways, Parks & Recreation Historical Preservation Division & Landmark Society of the Niagara Frontier

SOURCE: *Landscape Architecture*, January 1981

Establishing a progression of types of landscapes based on the degree and scale of intentional human intervention can assist in developing common definitions. At one end of such a scale is the wilderness, where natural processes predominate. In a *wilderness, or natural, landscape*, human activities certainly exist, but they do not appreciably modify the landscape.[21] Even if unmodified by human activities, natural landscapes may be invested with cultural significance and may therefore be worthy of protection because of their significance in American history. For example, Cumberland Gap in Tennessee was a major passageway through the Appalachians for settlers moving west in the 19th century and is celebrated in song and story.

Certain natural landscape features even have sacred significance for some cultural groups. For example, though they actually live many miles to the east, the Hopi Indians of Arizona regard the San Francisco Peaks as the sacred home of the *kachina*, the rain-giving spirits of the Hopi religion. The Peaks figure strongly in their origin legends and other traditional stories. Certain Plains Indian groups built stone structures, often called medicine wheels, that reflected their awareness of and reverence for landscape features.* Traditional Hawaiians consider the Waikaane Valley in Windward Oahu as sacred.[22] It plays an important part in the native history of the island.

We might call the next stage in the progression *settlement patterns*, as human manipulation of the environment becomes more obvious but there is little or no conscious planning. As people manipulate the land for particular purposes, reflective of the cultural values of a group, such settlement patterns merge into *cultural landscapes*.[23] Characteristically, the *cultural landscape* is the product of many groups or individuals working interdependently within a broad cultural context. The cultural landscape may reflect rural values, as reflected in rural historic districts,[24] or urban values, as found in the manufacturing towns of the Northeastern United States.[25] The *vernacular landscape*, which derives from the common style of a period or place, is one important form of a cultural landscape.

Finally, the *designed or planned landscape*,[26] in which the scale of manipulation of the earth is high, may be considered a subset of the cultural landscape, but one that reflects the conceptual model of a single individual or small group of individuals. Examples of designed landscapes range from small gardens to large-scale public or private parks (table 3).

The National Park Service (NPS) has established clear guidelines to distinguish between designed and vernacular landscapes. Nevertheless, because designed landscapes are generally thought of as deriving from a high art tradition, certain important historical vernacular landscapes might be overlooked or considered of less historical importance than, for example, formal gardens. However, folk traditions incorporate design traditions that may involve master builders and sophisticated learning and wisdom. It is therefore extremely difficult, perhaps impossible, to separate vernacular landscapes from design intention and from planning.

NPS has recently attempted to establish definitions for various types of landscapes, to guide

[21]In most cases, it is not correct to talk about an untouched natural landscape. For example, Native Americans, and later European settlers, regularly burned the Big Meadow of Shenandoah National Park, VA, to keep it open. Even hunter/gatherer societies may have deliberately burned the grasses, and otherwise altered the landscape over time. For example, see Clive Gamble, "The Artificial Wilderness," *New Scientist*, Apr. 10, 1986, pp. 50-54.

*Robert L. Hall, "Medicine Wheels, Sun Circles, and the Magic of World Center Shrines," *Plains Anthropologist* 30, 1985, pp. 181-194.

[22]John Charlot, "Historic Report on Waikane Valley," Testimony presented to the Feb. 9, 1977, Hearing of the Land Use Commission, Honolulu, HI.

[23]Melody Webb, "Cultural Landscapes in the National Park Service," *The Public Historian*, 9, 1987, pp. 77-89. "Cultural landscapes represent a continuum of land-use that spans many generations . . . [They] exhibit, either conspicuously or subtly, long-held values of their area or culture." Robert Z. Melnick, "Capturing the Cultural Landscape," *Landscape Architecture*, January 1981, p. 56.

[24]Robert Z. Melnick, *Cultural Landscapes: Rural Historic Districts in the National Park System* (Washington, DC: U.S. Department of the Interior, National Park Service, Park Historic Architecture Division, 1984).

[25]Mary Procter and Bill Matuszeski, *Gritty Cities* (Philadelphia, PA: Temple University Press, 1978).

[26]See also Melnick, op. cit., 1984, p. 40.

Table 3.—Historic Designed Landscapes

Small residential grounds
Estate or plantation grounds (including a farm where the primary significance is as a landscape design and not as historic agriculture)
Arboreta, botanical, and display gardens
Church yards and cemeteries
Monuments and surrounding grounds
Plaza/square/green/mall or other public spaces
Campus and institutional grounds
City planning or civic design
Subdivisions and planned communities/resorts
Commercial and industrial properties and parks
Parks (local, state, and national) and campgrounds
Battlefield parks and other commemorative parks
Ground designed or developed for outdoor recreation and/or sports activities such as country clubs, golf courses, tenis courts, bowling greens, bridle trails, stadiums, ball parks, and race tracks that are not part of a unit listed above
Fair and exhibition grounds
Parkways, drives and trails
Bodies of water and fountains (considered as an independent component and not as part of a larger design scheme).

SOURCE: National Park Service, "How to Evaluate and Nominate Designed Historic Landscapes," 1987.

the nomination of landscapes to the National Register. For the purposes of the National Register, a historic designed landscape is "a work that has significance as a design or work of art; was consciously designed and laid out by a master gardener, landscape architect, architect, or horticulturalist to a design principle, or an owner or other amateur using a recognized style or tradition in response to a recognized style or tradition; has a historical association with a significant person, trend, event, etc. in landcape gardening or landscape architecture; or a significant relationship to the theory or practice of landscape architecture."[27]

In addition to defining historic designed landscapes, and setting guidelines for evaluating them, NPS has focused attention on the category

[27]Keller and Keller, op. cit., p. 2.

Photo credit: Ray A. Williamson

William Paca House and Garden, Annapolis, MD: After being buried under a 200-room hotel, a parking lot, and bus station, this 18th century garden was restored in the 1970s based on the results of a careful research by archaeologists, architects, landscape architects, and historians.

of cultural landscape it refers to as the *rural historic district*. This subcategory of important cultural landscapes includes ethnic rural communities or rural farmsteads. The NPS publication, "Cultural Landscapes: Rural Historic Districts in the National Park System," defines the rural historic district as "a geographically definable [rural] area, possessing a significant concentration, linkage, or continuity of landscape components which are united by human use and past events or aesthetically by plan or physical development."[28]

However, earlier, this same publication calls rural historic districts "complex human ecological systems existing within equally complex natural ecological contexts. People modify those ecological contexts, and in turn the cultural patterns of the people are altered to fit the natural environment."[29] This latter definition illustrates the difficulty of finding the right wording to distinguish among the many different categories of landscapes. It does not seem to be restrictive enough, as it could also encompass other subcategories of cultural landscapes, including the historic urban vernacular historic landscape as well as certain designed historic landscapes. Indeed, the emphasis placed on the significance of designed historic landscapes in relation to other cultural landscapes appears to be a product of traditional high-culture patterns of thought in the United States. Yet, certain landscapes, such as those created by residents of the Pinelands area of New Jersey, are highly structured according to the aesthetic and other values of the local residents.[30]

All of these landscape types, whether wilderness, cultural, or designed landscapes, reflect values of the people who care for them. Within these broad categories exist many subcategories of landscapes; certain landscapes are of historic significance and are appropriate targets of preservation efforts. An essential first step in determining historic significance is the identification of the type of landscape under consideration.

[28]Melnick, op. cit., 1984, pp. 7-8.

[29]Melnick, op. cit., 1984, p. 4.

[30]*One Space, Many Places*, op. cit., ch. 5: "Aesthetic Resources and Sense of Place."

ISSUE B: *Because they are so susceptible to damage by human and natural causes, the greatest threat to historic landscapes is destruction, by intent or ignorance, before they have been identified as significant.*

Participants in the OTA assessment urged that preservation policy explicitly acknowledge the importance of historic landscapes and specify that they be protected to the same degree as historic structures and non-landscape archaeological sites. Such a policy should be publicly disseminated so that planning and design professionals, cultural and natural resource managers, and the public recognize the value of preserving and restoring historic landscapes. Establishing these values will assist in protecting landscapes from a wide variety of natural and human threats. The section, *Federal Policy Toward Landscape Preservation*, discusses options for strengthening landscapes preservation policy.

Tables 4 and 5 list many of the human and natural threats to which landscapes are susceptible. Because the nationwide perception of landscapes is not well developed, historic vistas may be destroyed casually, through intent, or by ignorance. For example, urban parks, which contain both natural elements and structures, are subject to increased visitation, vandalism, and arson. Increased development in urban, suburban, and even rural areas, has exerted enormous pressures on historic landscapes. Economic pressures that have altered the structure of American farming are also reshaping the countryside. Rural landscapes are now beginning to suffer from vandalism and arson.[31]

Inadequate identification and registry,[32] overuse, inadequate or inappropriate managerial/maintenance policies, and malicious destruction are the greatest threats to most historic landscapes. Yet, natural agents such as erosion, ex-

[31]For example, in some areas of West Virginia, wooden bridges, often a significant part of the historic rural landscape, are the target of arsonists. Barbara Howe, West Virginia University, personal communication, 1986.

[32]For example, many large earthworks in Ohio are known to professional and amateur archaeologists, and even to the public, but because they are on private land, many of them suffer from modern land use practices that erode and destroy them.

Table 4.—Human-Generated Threats to Cultural Resources[a]

Agriculture
Beautification
Construction
Demolition
Drilling:
seismic disturbances
Energy generation:
coal, gas, and oil exploration and extraction
powerlines
dams
powerplants
Fencing
Fire:
firefighting
fire rehabilitation
Grazing
Land abandonment and neglect
Mining
Overuse
Pollution:
air and water
Preservation activities
Recreational technologies:
metal detectors
off-road vehicles
Rehabilitation or retrofitting
Sand and gravel quarrying
Slash burning
Site compaction
Timber cutting
Theft
Urban sprawl
Vandalism

[a]Not listed in priority order.

SOURCE: Office of Technology Assessment, 1987.

Table 5.—Natural Threats to Cultural Resources

Acid precipitation
Air pollution
Disease
Drought
Erosion (wind and water)
Earthquakes
Fire
Floods
Freeze/thaw cycles
Invasive vegetation
Moisture
Pests
Salt air in coastal environments
Subsidence
Violent storms:
hurricane
tornado

SOURCE: Office of Technology Assessment, 1987.

cess moisture, drought, and severe storms can also significantly damage certain landscape elements.[33] Even normal plant growth can substantially alter the intended plan of a designed landscape in a few years unless the trees, shrubs, and undergrowth are properly maintained. Some plants must be kept in scale by pruning; others can be ruined if pruned. All of these threats can be significantly reduced by the appropriate application of planning and design principles and technology.

Most public land is subject to a variety of uses, some of which are more destructive than others. In order to make informed decisions concerning the cultural resources under their care, managers need to have an increased awareness of the value of historic landscapes and the necessary skills to identify, evaluate, preserve, and manage them. In short, managers need better access to landscape information. They also need to evaluate their component parts and develop maintenance recommendations that incorporate appropriate technologies and research. Use of such information will enable managers to justify requests for increased funding and personnel and, where appropriate, to preserve, protect, and interpret historic landscapes. However, considerably more research and development will be required to enable managers to put technology to better use in landscape management.

ISSUE C: *One of the major impediments to preserving significant landscapes is the poor state of knowledge of the Nation's historic landscapes.*

Because a historic landscape cannot be preserved until it is identified, inventory or survey is a crucial first step to preserving landscapes. However, not all historic landscapes can be preserved, for not all are historically significant. After being identified, the landscape's historic signifi-

[33]For example, Monk's Mound in Illinois, the largest prehistoric earthen mound north of Mexico, and part of the Cahokia Mounds Historic Site, has recently suffered significant damage as a result of rising internal moisture. Portions of the mound have slumped, or fallen away.

Box A.—Evaluating Significance of the Historic Landscape Using National Register Criteria

To be eligible for the National Register of Historic Places a historic landscape must possess the quality of significance in American history, architecture, archaeology, engineering and culture and integrity of location, design, setting, materials, workmanship, feeling, and association and

a. be associated with events that have made a significant contribution to the broad patterns of our history; or
b. be associated with the lives of persons significant in our past; or
c. embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
d. have yielded, or may be likely to yield, information important in prehistory or history.

In addition to possessing significance according to such historical themes established by the National Register as social history, agriculture, or transportation and meet criteria a. to d. above on that basis, a property nominated because it is a designed historic landscape should meet these criteria primarily on the basis of associations with landscape gardening or landscape architecture under criterion c.

SOURCE: Timothy Keller and Genevieve P. Keller, "How To Evaluate and Nominate Designed Historic Landscapes," *National Register of Historic Places Bulletin 18*, U.S. Department of the Interior, National Park Service, 1987, p. 6.

cance must be evaluated against criteria designed to ascertain its place in national, regional, or local history. Significance may involve such elements as art, commerce, exploration/settlement, landscape architecture, or prehistoric culture (see box A). Most nominations to the National Register are made by interested parties at the State or local level. On the national level, the National Register staff in the National Park Service decide the question of significance on the basis of National Register nominations.

Until recently, the Federal Government has expended little effort to identify and document nationally significant landscapes; no comprehensive, centralized listing of significant American landscapes exists. Even the National Register of Historic Places can provide only a crude list of National Register properties that are related to landscape architecture. Significant landscapes are either not on the National Register or are classified under other categories, such as districts or sites. Because they are split into several categories, it is extremely difficult to determine the total number of landscapes actually listed. Indeed, to be included on the National Register, landscapes must be nominated as districts, sites, or some other category. Some people feel that though this may cause some confusion to those seeking to nominate landscapes to the Register, adding new categories would cause greater problems. Others argue that preservation thinking has evolved and that including landscapes as a National Register category would accurately and appropriately reflect such a change in thinking.

A comprehensive national historic landscape survey would draw together the information we now have on significant landscapes and identify landscapes missed in previous, haphazard efforts. A national survey of designed historic landscapes could be an especially important first step, because greater agreement exists among professionals on what constitutes a designed landscape. A survey of designed historic landscapes might serve as a model for a much more comprehensive survey that includes other historic landscape types.

Such a survey was initiated by the Historic Preservation Committee of the American Society of Landscape Architects (ASLA) in 1984. The National Park Service has endorsed the survey and disseminated the survey form to State Historic Preservation Officers (SHPOs). In order for the survey to be consistent and carried out in a timely manner, it will be necessary to apply such standards and models uniformly on a nationwide basis at all levels of public and private preservation efforts. The resultant information should be made available through a central clearinghouse on a uniform database.

A survey of designed landscapes presents a logical place to start, but no significant progress is

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likely to occur unless funding is dedicated to the project. State Historic Preservation Offices will have no ready means to tackle a survey of this importance without new funding. In the meantime, the ASLA form provides a format to use, and its volunteer effort increases public and professional awareness of historic landscapes.

ISSUE D: *There is a critical need for a federally supported facility for landscape preservation technologies.*

Most participants in OTA's assessment cited the need for a new institution (or expansion of an existing institution's mandate) or center to foster the research and development of advanced technologies, the training of professionals in their use, and the centralization and dissemination of accurate technical information. Several museums maintain first-rate analytical facilities for conserving artifacts, but no comparable facility exists for conserving sites, structures, and landscapes. Most workshop participants agreed that a center for preservation technology should be federally supported, primarily because of the large stake the Federal Government has in fostering and guiding excellence in preservation, but also to ensure that standards, guidelines, and technologies are uniformly understood and applied.

As elaborated in chapter 7 of *Technologies for Prehistoric and Historic Preservation*, three structures are possible:

1. *Federal Center for Preservation Technology*: Congress could mandate the establishment of such a center within the Department of the Interior or some other Federal agency. The Center would assist the transfer of technology from other areas into prehistoric and historic preservation by developing new applications of existing technology, providing training for preservation professionals, and serving as a clearinghouse for disseminating information on preservation technologies. A Center should have a highly trained staff. It should also have the facilities for developing technologies relevant to all phases of the preservation process for prehistoric and historic sites, structures, and landscapes. In addition to serving as the focal point for technology-related preservation information within the Federal Government, such an institution would provide needed assistance to State and local governments and to the private sector. All agencies and private individuals and groups with preservation problems would therefore have a central place within the Federal Government to look for technical help. Conversely, techniques used in these projects could then be centrally documented and available for application to similar projects throughout the country, whether they are funded by public or private sources.
2. *National Center for Preservation Technology*: Alternatively, Congress could create a National Center for Preservation Technology, managed by a consortium of universities and preservation organizations. Such an institution would be able to draw on a multitude of different skills in several universities, and in many university departments. Like the Federal Center, it would develop and test new applications of technologies, conduct training, and distribute information. However, it would be free to contract with agencies and with States and the private sector to develop technologies of specific interest to them. Because it would also otherwise be free of constraints imposed by being housed within the Federal structure, such an organization might be more innovative than a Federal laboratory. Though it would serve as a resource for the Federal Government, like the Federal Center outlined above, it would also serve State and local needs.
3. *Preservation Technology Board:* Additionally, Congress might wish to consider supporting a Preservation Technology Board. Even if one of the two options for creating a Center for Preservation Technology were adopted, a Board composed of professionals from all parts of the preservation community would be needed to provide guidance for a center, determine current needs for technology in prehistoric and historic preservation, develop standards for the application of new technologies, and assist in disseminating information. The professional societies concerned with archaeology, his-

tory, historic structures, and historic landscapes are likely to be highly supportive of such a Board.

In December 1986, representatives from several national preservation organizations, including the Society for American Archaeology, the Society for Archaeological Sciences, the National Trust for Historic Preservation, the National Coordinating Committee for the Promotion of History, and the National Council on Public History, met informally to discuss the need for a center for preservation technology and the potential for achieving it. They formed the Coalition for Applied Preservation Technology (CAPT), which is devoted to exploring the potential of such an institution and "to develop an organizational framework to facilitate the development, application and transfer of advanced technology in preservation."[14] CAPT held its first organizational meeting in Washington, DC on February 27, 1987 at the National Trust for Historic Preservation. It has formed committees to investigate different aspects of a center (table 6).

If a Center for Preservation Technology were established, landscape preservation concerns would constitute part of the center's workload. The section, *Federal Policy Toward Landscape Preservation*, discusses several landscape preservation problems such a center might pursue.

ISSUE E: *Systematic and long-term maintenance is one of the most effective methods of slowing deterioration from human and natural agencies.*

Systematic preventive maintenance and upkeep can prevent minor problems from becoming major worries. It is absolutely crucial to the conservation of a landscape, particularly because landscapes change so rapidly as a result of plant growth or deterioration. Managing the maintenance of a landscape requires continuous attention to its specific needs. Quality and appropriateness of maintenance is as important as its regularity.[15] A variety of technologies, including microcomputer-based maintenance management systems, are available to improve such practices and make them more cost-effective.

The designers and builders of many historic landscapes, such as parks, and gardens of historic houses, expected that these landscapes would be maintained by adequate numbers of skilled personnel. Today, especially when so many historic properties are owned and maintained by public agencies, gardeners and other maintenance personnel may not have adequate experience or training. Likewise, contracting stipulations that limit governmental agencies without in-house expertise to accepting the services of lowest bid competitors often result in substandard groundskeeping and maintenance practices.

Because maintenance tends to be labor-intensive, it is important to find ways to reduce the amount of labor required. For example, Sleepy Hollow Restorations, in New York State, has reduced its total labor force by developing a program of maintenance that employs two levels of skills. For the basic grounds, the organization uses grounds maintenance employees with only moderate training and skills. It employs college graduates for maintaining the historic gardens. Although the latter command higher salaries, their higher skill and professional interest in historic gardens more than repays the extra investment. In the winter, when maintenance needs are less demanding, these workers carry out research projects that they can apply to improving the historic gardens (e.g., searching out the original garden plantings and determining modern sources). Because such workers generally possess higher

[14]Coalition for Advanced Preservation Technology "Dear Colleague" letter, Jan. 19, 1987.

Table 6.—Working Groups of the Coalition for Applied Preservation Technology

Working Group on Research and Development
Working Group on Applications Issues
Working Group on Public Education and Involvement
Working Group on Technology Transfer Issues
Working Group on Technology Clearinghouse

SOURCE: Coalition for Applied Preservation Technology

[15]*Cyclical Maintenance for Historic Buildings*, J. Henry Chambers, AIA, Interagency Historic Architectural Services Program, Office of Archaeology and Historic Preservation, National Park Service, U.S. Department of the Interior, 1976. Although this reference is directed toward historic buildings, many of its general recommendations are appropriate for landscapes.

communications skills, they are also more effective in articulating required maintenance tasks to outside contractors who trim the large trees and do other specialized work.

Maintenance standards and plans must be developed and carried out by managers professionally trained in tending historic properties. The increased use of personal computers and specially designed software could be extremely helpful in improving the quality and quantity of landscape maintenance. For example, a computerized management plan for a landscape would allow landscape managers to factor in a number of tasks on a cyclical basis. Such a plan could allow for the fact that each species of tree, shrub, and plant requires different treatments on different schedules. Structures such as bridges, pavilions, and interpretive centers require yet a different set of maintenance strategies. Maintenance management systems allow computation of needed labor resources based on assumptions about maintenance standards and landscape systems, and provide the capacity to match up such needs with available labor. They also enable managers to develop a schedule for maintenance that takes into account the level of education and skills of the maintenance personnel. A detailed maintenance plan could also assist in justifying training in skills that are needed but not available from current staff.

Expert systems,[36] which have been developed to aid decisionmaking in practical tasks in other fields, such as diagnosing diseases, repairing mechanical systems, or analyzing molecular structure, could also be developed for landscape management. Such systems might be especially effective in developing information and decisionmaking for certain maintenance tasks, especially those that call for highly specific, readily describable techniques, but they should not be considered a substitute for training in the application of the technologies.

ISSUE F: *Greater public understanding of reasons to preserve historic landscapes is needed to build popular support for the identification and preservation of historic landscapes.*

Public officials and other citizens are often unaware of the value and significance of historic landscapes. Traditionally, historic preservationists have worked from the grassroots by building local constituencies that have identified the value of a given structure or archaeological site and sought State or National help in preserving it. However, in landscapes, the local groups who might identify landscape value often do not exist, in part because they lack adequate information about why certain landscapes might be important to our cultural history. Often those who are most familiar with a landscape are least aware of its value.

In the case of designed historic landscapes, most people are unaware that they were designed, or what goes into a design, and why it may be important to maintain the design's integrity. Although this is true for such areas as Central Park, prehistoric designed landscapes may be even more subtle to the modern eye. For example, it may not be immediately obvious to the casual observer that the prehistoric designers and builders of the Serpent Mound in south central Ohio chose a particularly dramatic site for the placement of their design.[37] The serpent effigy is located on a northerly slope between the junction of two local creeks. The setting not only displays the design skill of the artisans and builders, it allows the spectator to view the construct in its entirety from several different vantage points. Although we can only speculate about their reasons for choosing this particular site, it was well selected for the particular design its ancient builders wished to execute there (see p. 7).

Historic vernacular landscapes may be appreciated the least by the local people who live and work in it. For example, farmers within a rural

[36]See U.S. Congress, Office of Technology Assessment, *Information Technology: R&D Critical Trends and Issues*, OTA-CIT-268 (Washington, DC: U.S. Government Printing Office, February 1985); also *Technologies for Prehistoric and Historic Preservation*, "Ch. 5: Preservation Information."

[37]"In 1846, the snake's body was more than 1.5 meters high and 9 meters wide, but erosion and cultivation have reduced these dimensions to about 1.2 by 6 meters." William N. Morgan, *Prehistoric Architecture in the Eastern United States* (Cambridge, MA: MIT Press, 1980), p. 23.

historic district may be so familiar with their surroundings that they fail to recognize their special characteristics. The distinctive urban historic landscapes represented by the northeastern mill towns are thought by some local residents merely to represent outmoded industry. Yet such areas played an important part in the industrialization of the United States and reflect late 19th century values and conditions. In some cities these areas have served as a focal point for the revitalization of the city.[38]

Where local support for preserving landscape values has developed, it has often acted to enlarge the scope of historic districts. For example, in one case in Jefferson County, Kentucky, the Tyler Settlement, a site consisting of a few farm houses and auxiliary buildings, was nominated to the National Register of Historic Places. However, the people of Jefferson County realized that the houses had little to do with the significance of the area. Instead, they recognized the agricultural patterns, the associations of the families, the stonework, the fences, and other components as significant, integral elements of the whole landscape. The local people, working through their certified local government[39] (CLG), did the research necessary to expand the scale of the nomination to the 600-acre Tyler Settlement Rural Historic District. This was the first fully documented rural historic landscape in Kentucky.

As citizens become more aware of the influence of historic landscapes in their lives and landscapes' importance to the history of the Nation, local nominations to the National Register of Historic Places are likely to increase in number and scope.

[38]Procter and Matuszeski, op. cit.

[39]A certified local government is one that is certified to receive funding from the Historic Preservation Fund, administered on the State level by the State Historic Preservation Office.

TECHNOLOGY AND LANDSCAPE IDENTIFICATION

Two fundamental issues pertaining to historic landscapes need to be addressed by investigators and managers: what was the landscape like during its prehistoric or historic period, and what is it like in the present? The answers are found in two sometimes quite different sources: information derived from documentary sources and information derived from the landscape itself.[40] As historian Thomas J. Schlereth has suggested in a study of the landscape along U.S. Route 40 in Indiana,

> To know U.S. 40, and by inference any American "roadscape", one must embark on an intellectual and geographical odyssey. That is to say, one must confront the "roadscape" directly, by walking or riding over it as well as by exploring it vicariously in reading what others have written, photographed, mapped, sung or exhibited of it. One needs to do both reading and roaming . . .[41]

Various technologies can help make reading and roaming more cost-effective and time efficient.

Identifying and inventorying historic landscapes requires four basic steps:

1. identifying and accessing records of the known resources;
2. identifying previously unidentified historic landscapes and locating archival records, documents, and nondocumentary evidence concerning them;
3. recording, storing, and augmenting the newly acquired data; and
4. detailed ground survey and documentation.

Technologies that simplify and enhance the identification and documentation of landscapes range from such mundane, basic techniques as the use of volunteers wielding pencil and paper to sophisticated computer systems that can assimilate, manipulate, and store graphical information and generate complicated maps of a region. The following examples illustrate this range. In general, the various technologies and sources of information are not exclusive, but may build upon one another.

Documentary and Nondocumentary Sources

The investigation of various kinds of documentary sources—manuscript materials, knowledgeable inhabitants, business and family records, local histories, novels, quilts, folksongs, newspapers, poems, photographs, paintings, drawings, diaries, letters, maps, advertisements, catalogs, films, surveyors' field notes and maps, or even types of plants—will help the investigator better understand what he or she sees in surveying a site.[42] As one landscape historian has commented:

> We need to know the persons involved—designers, clients, users; the means at hand—financial resources as well as natural ones, available technology, materials and labor supply; the design concepts and criteria that were at work as the landscape took form, whether the designer was conscious of them or not; and finally the chronology of events that either enhanced or disrupted the realization of the original scheme.[43]

A historical survey is the first step in beginning to read a historic rural district. Such a survey includes information about broad settlement patterns of the region, including important people; regional demography of both the past and the present; social, political, economic and cultural trends, forces, and patterns. Known anthropological, historical, folkloric, and archaeological data also should be incorporated in a survey. This information forms the historical context within which to evaluate the natural as well as cultural resources of the district (table 7).[44]

[40]Melnick, op. cit., 1984, p. 8.

[41]Thomas J. Schlereth, *US 40: A Roadscape of the American Experience* (Indianapolis, IN: Indiana Historical Society, 1985), p. 61.

[42]Delores Hayden and Peter Morris, "The Quiltmaker's Landscape," *Landscape* 25, No. 3, 1981.

[43]Catherine M. Howett, "Landscape Research: Keeping Faith With Today and Tomorrow," *The Yearbook of Landscape Architecture: Historic Preservation* (New York, NY: Van Nostrand Reinhold, 1983), p. 7.

[44]Melnick, op. cit., 1984, p. 16.

Table 7.—The Material Components of the Rural Historic Landscape

Overall patterns of landscape spatial organization
Land-use: categories and activities
Response to natural features
Circulation networks
Boundary demarcations
Vegetation related to land use, such as hedge-rows, orchards, or ornamental plantings
Cluster arrangement
Structure: type, function, materials, construction
Small-scale elements, such as cattle chutes, water troughs, or isolated grave markers
Historical views and other perceptual qualities

SOURCE: Robert Z. Melnick, *Cultural Landscapes: Rural Historic Districts in the National Park System* (Washington, DC: U.S. Department of the Interior, National Park Service, Park Historic Architecture Division, 1984)

Archival Research

Archival research and interviewing (oral history) are important first steps in identifying historic sites, including landscapes. Preliminary research that is done with care and imagination can save time and money as well as provide a focus for field work and a broad basis for establishing historic significance. Developments in archival technology, such as optical disk storage and retrieval, and computerized databases can make the records search more efficient and even more cost-effective than it is now.[45] Such research may benefit from the assistance of professional historians who have been trained in archival methods.

The technical questions involved with this type of historical research specifically concern methods of access to information in the institutions that house it, and ways of arranging data to make them usable for preliminary analysis and in developing a research plan. Interviewing depends on the technologies for tape recording and archiving electronic storage media, if oral history materials are to be retained. It also depends on knowledge of good interviewing techniques.

Maps

A variety of historic and contemporary maps can be used to discover historic landscapes and other cultural features, such as archaeological sites and historic structures. Historic maps primarily depict natural and political boundaries and cultural features, such as growth patterns, place names, Indian trails, roads, railroads, structures, and fence lines. In addition to displaying such features, contemporary maps, often made from aerial photographs or images sensed from spacecraft, may reflect the topography of a region or its natural resources and geology. This additional information can be particularly useful for discovering and analyzing historic landscapes.

Because early mapmaking methods often introduced major systematic errors into maps, and tended to treat the earth's surface as if it were a plane, extracting useful historic information from very early maps can often be extremely difficult. However, methods developed by historical cartographers for determining the planometric accuracy of early maps can be applied to them to correct their systematic errors. The corrected version can then be used to locate historic features on current maps or in the field.[46]

A comparative sequence of maps from different time periods can reveal cultural patterns and how the cultural components of an area change over time.[47] Property survey maps and records, which are generally stored in county archives, as well as old tax records are also of use in interpreting land use patterns. Historic aerial photographs (see below) can also be used like maps to compare land use patterns over time.

Historic Photographs

Historic photographs, including aerial photographs, are an excellent source of landscape information and invaluable tools of identification and interpretation. Not only do they often capture a small slice of life in a landscape by showing people doing things, they show historic vegetation and structures, and may serve to document the changes in a landscape over time. Care and sophistication should be used in reading historic photographs because, like maps and other records, they are subject to a variety of distortions.

[45] *Technologies for Prehistoric and Historic Preservation*, "Ch. 5: Preservation Information."

[46] Thomas E. Davidson, "Computer-Correcting Historical Maps for Archaeological Use," Maryland Historical Trust, manuscript, n.d.

[47] J.M. Hooke and R.J.P. Kain, *Historical Change in the Physical Environment: A Guide to Sources and Techniques* (London: Butterworth Scientific, 1982).

For example, "landscape photographs"[48] may present views selected according to aesthetic standards applicable to the era in which they were taken.[49]

> Photographs present the historian with a visual record of a "moment in time" stopped indefinitely for his inspection. As such, it provides a direct record of how things and people looked, in a way that endless accounts of written records could never achieve.[50]

For example, photographs from the late 19th and early 20th century document how the historic center of Annapolis, MD, has changed in the intervening years. They illustrate that certain areas of the city have experienced surprisingly little change over the years, while others have been altered to the point that they would be totally unrecognizable today to a visitor from the past.[51] Because photographs of landscapes are often byproducts of other interests of the photographer, they also show aspects of landscapes that no one at the time thought were important to point out.

In historic designed landscapes, historic photographs may reveal vegetation and important elements of the landscape that do not appear in the original landscape drawings, either because the owner altered the plan, or because the available plans do not reveal the overall setting. Photographs are especially important for disclosing the surroundings of a formal garden. Among other things, such evidence may allow historians to discover the placement of an original garden now destroyed or buried.

Photographs may also provide valuable information about design intent. One example is a 1904 photograph of Olmsted's home, Fairsted (now Olmsted National Historic Site), which shows the house covered with vines.[52] A plan of the same year fails to indicate the vines at all. Thus, photographs and plans provided different information, and both are needed to present the total picture.

Historic photographs are available from State and local archives, museums, private collections, antique dealers, and individual families. Aerial photographs are of particular importance, as they can show broad-scale patterns of land use and disturbance (see section below on remote sensing.)

Historic photographs can be especially valuable in showing what plantings and landscape features existed around a historic structure whose gardens were not formally designed and thus for which no plans are available. For example, photographs taken of the Frederick Douglass Home, Cedar Hill, while Douglass lived there showed shade and cedar trees and plantings around outbuildings, as well as the location and materials of such features as fences and a grape arbor. These photographs enabled the "re-creation" of a plan of how the grounds appeared when Douglass lived there. References in correspondence and receipts of items purchased refine our knowledge of the kinds of plantings and construction materials used.[53]

Historic Drawings and Plans

For historic gardens, parks, and other designed landscapes, the original plans or drawings of the landscape, if they exist, are of great importance in identifying and eventually restoring and preserving the designed landscape. These documents may be stored in various specialized archives, such as the Warren H. Manning Collection at Iowa State University,[54] and the Olmsted archives at the Frederick Law Olmstead National Historic Site, or more generalized archives such as the Library of Congress and National Archives and Records Administration.

[48]John Szarkowski, *American Landscapes: Photographs From the Collection of the Museum of Modern Art* (New York: Museum of Modern Art, 1981).

[49]John R. Stilgoe, "Popular Photography, Scenery Values, and Visual Assessment," *Land-cape Journal*, vol. 3, No. 2, 1984, pp. 111-121.

[50]Arthur C. Townsend, "Interpreting the Historical Photograph," in Marion E. Warren and Mary Elizabeth Warren, *The Train's Done Been and Gone* (Boston, MA: David R. Godine, 1976), p. 13.

[51]Warren and Warren, op. cit., 1976.

[52] Shary Page Berg, personal communication, 1987.

[53]Darwina Neal, National Park Service, personal communication, 1987.

[54]William J. Grundmann, "Warren H. Manning Collection," Department of Landscape Architecture, College of Design, Iowa State University, 1985.

Plans and drawings done by professional designers or design firms are often retained in the firm's archives if the firm still exists. More often, however, the landscape architects worked alone or had few employees, so that the office closed when they ceased to practice. Files from such an office may have been passed on to another firm, donated to State or local historic societies, or given to universities, especially those with schools of landscape architecture. In other cases, records of projects may have been given to the clients who commissioned them. Many such plans are simply destroyed.

In many cases, architectural and landscape architectural plans were generally intended for short-term use and little or no thought was given to the possibility that they might later be placed in an archive. As a result, plans and drawings were not always done on durable paper or properly stored. New conservation and copy technologies are needed. Computer technology for copying drawings, digitizing the information they contain, and reproducing them is already available.[55]

Until recently, there has been no central listing of such records. The newly established Catalog of Landscape Records in the United States project (box B) is an attempt to remedy this. Few collections that do exist are cataloged in a systematic way, making access and retrieval particularly difficult. For example, the collection of records of the Olmsted firm, which NPS acquired in 1980 as part of the Olmsted National Historic Site, is one of the few collections of landscape architectural records under the care of a curator. It includes over 100,000 individual plans. Although they are generally organized according to design project, many have been misfiled over the years; no comprehensive inventory exists.[56] The lack of specific inventory makes it difficult for those carrying out a general inventory to answer such questions as: what plans exist for a particular property? or what projects did a particular member of the firm work on?

[55]See OTA, *Technologies for Prehistoric and Historic Preservation*, op. cit., "Ch. 5: Preservation Information," for additional discussion of the conservation problem.

[56]Shary Page Berg, "Rescuing Fairsted," *Landscape Architecture* 77, 1987, pp. 83-85.

Additional Documentary Evidence

Because landscapes change so rapidly, design intent is even more important, and more difficult, to establish. Therefore, correspondence, or design statements may provide important clues to understanding a landscape. Newspapers, manuscripts, family records, personal correspondence, local written folklore, even postcards,[57] may provide useful information concerning landscapes and the public's attitudes toward them.

Landscapes can also be captured and studied in media that may not immediately come to mind. For example, American music frequently has expressed the grandeur and specificity of the way the landscape looks and sounds. Such music demonstrates how people relate to and feel about the land. In fine-art expression, the sounds of landscapes create the Pennsylvania countryside in Aaron Copland's *Appalachian Spring* and western vistas in Ferde Grofe's *Grand Canyon Suite*.

The humorous folksong "Cumberland Gap" details some of the problems the mountainous landscape created for travellers. John Denver's "Country Roads" waxes with nostalgia, but evokes the West Virginia mountain landscape left behind. Although Steve Goodman's song, "The City of New Orleans," details the atmosphere of the inside rather than outside "trainscapes", the place names alone put the trip and the sense of loss for a sort of transportation and a crucial piece of American history into the context of past and present.[58] The popular song "Route 66" describes a "roadscape" familiar to drivers before the advent of Interstate 40.

Even historic movies can be sources of information about landscapes and how they are perceived. Both documentaries and artistic movies provide images of the landscape and how they were used.[59] The silent movies of the early part

[57]Hilary Lamber Renwick and Susan Cutter, "Wish You Were Here: Map Postcards and Images of Place," *Landscape*, vol. 27, No. 1, 1983, pp. 30-38.

[58]For railroad landscapes, see John R. Stilgoe, "The Railroad Beautiful: Landscape Architecture and the Railroad Gardening Movement, 1867-1930," *Landscape Journal*, vol. 1, No. 2, 1982, pp. 57-65.

[59]Gena Crandell, "Moving Pictures," *Landscape Architecture*, November 1985.

Box B.—Catalog of Landscape Records in the United States

The American Garden History Program at Wave Hill, Bronx, NY, has recently embarked on a project to develop a systematic inventory of American landscape documentation. The project's ultimate goal is to identify, locate, and disseminate information about all documents for American landscapes.

Because no other such catalog exists, the resulting *Catalog of Landscape Records in the United States* should be a valuable tool for planners, preservationists, landscape architects, designers, ecologists, foresters, historians, park administrators, horticulturalists, researchers, and educators. In the first phase of the project, the Catalog staff will emphasize the collection of information on designed, manipulated, or managed landscapes. However, the *Catalog* will accept information about any documents or collections related to landscapes, including rural, vernacular, or cultural landscapes.

Entries to the *Catalog* will be organized according to: landscape architect, designer, or patron; site; and repository of information. It will be available on a database using U.S. MARC/AMC format. The database will adhere to the Library of Congress' standards for Archives and Manuscripts Cataloging (AMC) in order to facilitate the exchange of information.

The *Catalog* will also publish a quarterly newsletter, available free of charge.

SOURCE: Wave Hill, Bronx, NY.

of this century provide an especially valuable record of the landscapes of California and New York.

Above-Ground Archaeology—Nondocumentary Evidence

Place names, buildings, markers, vegetation, road size, infrastructure elements, and other physical evidence contain important clues to the identification and analysis of landscapes.[60]

Vegetation.—Ecologists, folklorists, forest and agricultural historians, cultural and historical geographers, and landscape architects have all done important work in interpreting landscape vegetation patterns. However, the British "history on the ground movement" is far ahead of American historians in terms of reading the landscape for clues to historical events, as is the German tradition of Volksbotanik scholarship.[61]

The kinds and patterns of vegetation can reflect a design planned by someone who understands the relationships between light and shade, mass and clearings, plantings and structures—a famous landscape architect on one hand, a committed local gardener in a frontier wilderness on another, though their processes and patterns may be very different. Plants reveal patterns of settlement and use, protection of property, and environmental and aesthetic improvement in a landscape. Plantings may also be used to commemorate important life events such as marriage, birth of children, or death.[62] Trace plantings such as daffodils, exotic flowering shrubs, or fruit trees can denote abandoned homesteads. Peach trees and lilac bushes were often planted around homes in the Cuyahoga Valley of Ohio. In the Southwest, four wing saltbush (*Atriplex canescens*) and wolfberry (*Solanum jamesii*), often indicate the presence of ruined Pueblo prehistoric dwellings.

Local folklore often reveals the importance of certain places to the local populace. Such information can often only be obtained by interviewing local residents.

Gathering and Analyzing Site Information

The survey of landscapes is a precursor to their eventual analysis and evaluation as part of a region's historic record. A considerable amount of the information necessary for understanding the history of an area is available in the survey records

[60]John J. Stewart, "Historic Landscapes and Gardens," American Association for State and Local History Technical Leaflet 80, *History News* 29, No. 11, November 1974.

[61]Thomas J. Schlereth, *Artifacts and the American Past* (Nashville, TN: American Association for State and Local History, 1980), p. 147.

[62]For example, some North Carolina migrants brought "coffin" pines to the midwest to provide a soft wood for coffins. They were apparently sometimes planted in pairs, one for each partner. Thomas J. Schlereth, *Artifacts and the American Past* (Nashville, TN: American Association for State and Local History, 1980), 154.

alone. For example, the New Mexico Historic Landscape Survey has shown that merely examining the various landscapes defined by the original town centers of the cities of New Mexico enables the observer to glean important clues about the values of the individuals who designed them and settled there.[63]

The following sections outline some of the techniques, methods, and equipment that can assist landscapes survey.

Volunteer Survey

This technique is commonly used for historic preservation, especially in cases where funding for general surveys is often highly limited, and where local lay knowledge of historic sites is high. The use of volunteers, using printed forms such as the ASLA Designed Historic Landscapes National Landscape Survey Form,[64] has the signal advantage that its use requires little special training beyond a knowledge of landscape values and the significance categories of the National Register. However, it is difficult to obtain uniform results from the efforts of many different volunteers, with varying knowledge, experience, and values, from many different regions of the United States. Volunteer efforts are generally most successful when the volunteers have received appropriate training from historic preservation professionals, where ongoing professional guidance is available to ensure consistency, and where the project is small or highly focused.

Measured Drawings

Documentation of a landscape after it has been identified as having historic significance, is an important part of the overall survey process.

[63]Baker H. Morrow, "Old Landscapes, New Ideas: New Mexico's Historic Landscape Architecture," *New Mexico Architecture*, September-October 1985.

[64]OTA, *Technologies for Prehistoric and Historic Preservation*, op. cit., app. F.

Photo credit: National Park Service, Historic American Buildings Survey

Cascade area, Meridian Hill Park, Washington, DC

Measured drawings, employing techniques borrowed from the field of structural architecture, are an excellent means of thoroughly documenting a landscape.

In 1985, the Historic American Building Survey (HABS) undertook a measured drawings project at Meridian Hill Park, Washington, DC, which could serve as a useful model for such documentation. Meridian Hill Park designed and constructed from 1912 to 1936, was inspired by French and Italian Renaissance landscape designs.[65]

At Meridian Hill, the documentation began with a complete set of architectural base maps. Five large HABS sheets linked by pinbar matchlines were covered by matching overlays with "graphic representations" of trees, shrubs, and vines, as well as tree diameters and canopy sizes. Though the drawings display where elements of the landscape are located, they are not able to capture the essential landscape spatial qualities of Meridian Hill Park. Therefore, the recorders used photography to supplement the base maps and provide a sense of the landscape. A complete set of standard 4x5 inch HABS photographs was taken of the whole park. Five views, chosen for their historic importance for design and extent of change, were printed at a large scale onto HABS Mylar. Some of the areas were then reconstructed on Mylar overlays, based on historic photographs and research. In addition, some resources of particular architectural interest were detailed in a standard HABS format.[66]

The HABS survey of Texas missions[67] illustrates the recording of buildings that create spaces, such as courtyards or patios, which, though they are defined by the buildings, are historic landscapes in their own right. New Mexican plazas, courtyards, and courthouse squares have been documented by the State Historic Preservation Office as part of its survey of New Mexico landscapes.[68]

University Landscape Architecture Programs

Landscape architecture schools provide an important potential source of expertise and commitment to documenting significant historic landscapes. The University of Virginia's Architectural History Program offers a class in measured drawing, which has provided HABS documentation for hundreds of Virginia historic buildings over the years.[69] University of Delaware students have carried out much of the basic survey for the State of Delaware in a similar drawing program.

Computers

The computer is one of the most powerful tools available for identifying, analyzing, and evaluating historic landscapes. When used with other technologies, such as optical disks, graphics design and display software, or computerized databases, the computer can dramatically increase the preservation community's access to information and its ability to exploit information effectively.

Computer Aided Design (CAD).—CAD software,[70] when used with the appropriate microcomputer, makes it possible to draw and store a given landscape and to manipulate and alter the drawing later without having to redraw unaltered elements. Various elements of the landscape, such as trees, fences, shrubs, other plantings, and structures, can also be independently generated and stored in memory for placement in appropriate parts of the landscape. Such software allows one to remove elements of the current landscape, such as contemporary structures or newer plantings, and render it both as it appeared in the historic era in which it was designed, and as it has evolved. In restoring an

[65]Because structural architectural elements, such as retaining walls, steps, cascades, and fountains play a dominant role in the park's design, HABS recorded Antietam National Battlefield, a landscape with more natural components, in order to expand its guidelines for the documentation of landscapes in 1986.

[66]Paul Dolinsky, "Landscape Recording: Expanding the Tradition," *CRM Bulletin*, vol. 9, June 1986, pp. 16-17.

[67]Kenneth L. Anderson, "Mission Project Brings Praise from Park and Region," *CRM Bulletin*, vol. 9, No. 3, June 1986, pp 11-15.

[68]State of New Mexico, "First Annual Report, Registry of Historic Landscapes," op. cit.

[69]Orlando Ridout V, Maryland Historical Society, personal communication, 1987.

[70]One example is Landcadd, which operates with AutoCAD, a generalized computer drafting and design software package. See E. Bruce MacDougall, *Microcomputers in Landscape Architecture* (New York, NY: Elsevier, 1983) for a general discussion of microcomputers for treating landscape design and management.

historic landscape, these design programs make it possible to predict the general "look" of a landscape after several years. High-quality plotters can produce accurate drawings in a fraction of the time required to do them by hand. Such systems can also vastly improve the speed and reliability of producing scaled drawings.

Computer-Aided Survey.—If possible, computers should be used from the very beginning of survey work, both to increase accuracy and to reduce overall labor. Inexpensive, small, portable (lap) computers now available make it possible to enter data in the field, reducing the total amount of effort in carrying out a survey, and ensuring greater uniformity. Forms can be entered and stored in the computer ahead of time for data entry in the field. Additional notes and other relevant information can also be entered and stored on the computer. Their relatively low price and the availability of word processing and database software make portable computers extremely attractive for such work.

Even if, for reasons of cost or other considerations, it proves infeasible to take computers into the field, it is possible to design survey forms for easy field recording of data and subsequent entry into a computer database.

Photography and Videogrammetry

Photography and videogrammetry are powerful methods for documenting a variety of historic resources, including landscapes. Stereophotogrammetric methods that use a photo-theodolite enable detailed landscape documentation in three dimensions.[71] Advances in this technology that depend heavily on digital computer applications, rather than precision optics to achieve accuracy, promise to make documentation of material cultural resources much cheaper and more capable.

Architectural photogrammetry has not been developed in the United States at a level comparable to that found in countries such as Austria, France, the Federal Republic of Germany, and in other European countries. In the United States, the use of accurate measured drawings is given relatively low priority in the preservation of structures and landscapes. Yet, the use of architectural photogrammetry is cost-effective, as such methods lead to a marked increase in accuracy and productivity over the labor-intensive requirements for preparing measured drawings using traditional methods depending on direct measurements. For this reason, developing countries such as Indonesia, Peru, and Turkey now have their own photogrammetric services.

Video and optical disk technologies can both be powerful tools for survey and identification of landscapes. Video techniques have proved especially helpful in the survey of archaeological resources, and for rapid survey of city neighborhoods and historic structures.[72] Optical disks can be used to store video, movies, and photographs or drawings of cultural resources for rapid retrieval and comparison.[73]

Landscape Databases

Computerized databases of various kinds are crucial to the efficient use of information. As computers have become increasingly more capable and cheaper to acquire, individuals and small institutions have begun to develop their own powerful databases, and to communicate, by telephone and modem, with other databases around the world.

At present, no national database of historic landscapes exists, either in the form of a landscapes inventory or a list of records collections. An important first step in developing a national database will be to create a database listing locations and general contents of landscape records and collections throughout the country. A second step would be to establish a uniform database for an inventory of historic landscapes, using a standard survey form. State and local databases are highly incomplete and lack information on location of records and landscapes. In most cases,

[71]OTA, *Technologies for Prehistoric and Historic Preservation*, op. cit., pp. 52-54.

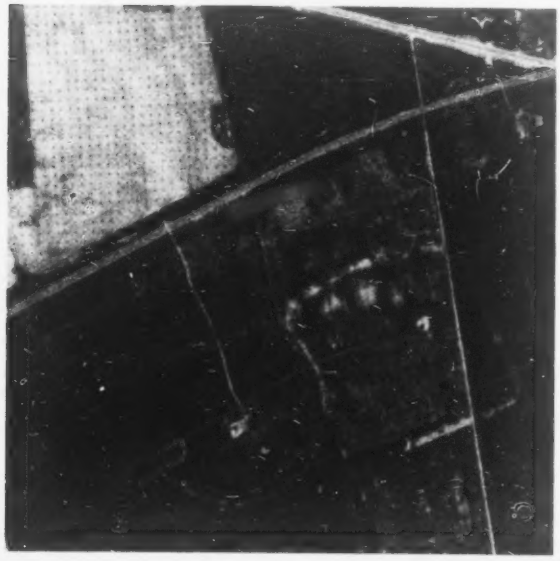
[72]Andrew Lippman, "Movie-Maps: An Application of the Optical Videodisc to Computer Graphics," *Proceedings of SIGGRAPH '80: Seventh Annual Conference on Computer Graphics and Interactive Techniques*, Seattle, WA, July 14-18, 1980.

[73]OTA, *Technologies for Prehistoric and Historic Preservation*, op. cit., ch. 5.

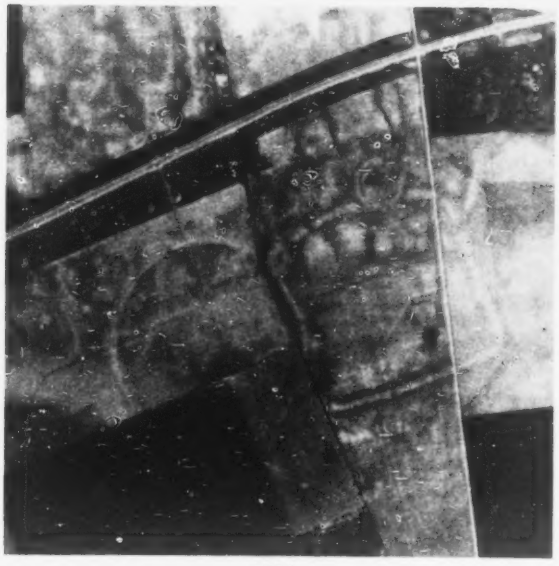
the surveys that might support a database have not been done. A national listing would significantly assist the identification of historic and prehistoric landscapes. The following databases contain some information about historic landscapes.

The Library of Congress.—Its National Union Index to Architectural Records, which is only available at the Library, contains some information about landscapes. This database can be accessed by the name of the designer, architectural firm, partner, name or geographic location of a building or structure, and location of the repository of information. It cannot be searched by landscape type.

The National Park Service.—The National Register Information System, maintained by the National Register of Historic Places, contains information on over 45,000 historic structures,



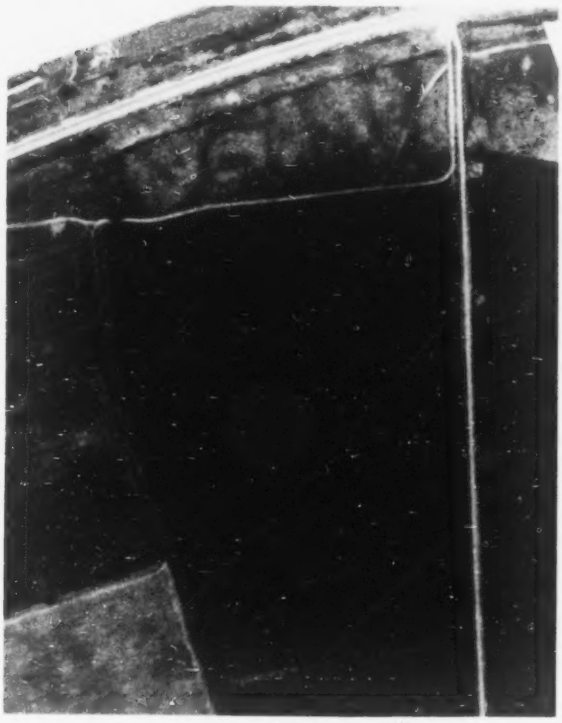
1938



1951

This series of aerial photographs, taken in 1938, 1951, and 1985 illustrate the use of aerial photography in documenting the gradual deterioration of prehistoric Indian mounds as a result of intensive periodic plowing.

SOURCE: John Edward Blank, "An Aerial Photogrammetrical Analysis of the Hopeton National Historic Landmark, Ross County, Ohio." Report prepared for Archaeological Services Department, Ohio Historic Preservation Office, December 1985.



1985

objects, and sites in the United States, both listed and determined eligible for listing.

In addition, NPS maintains a database of all the landscapes within the National Park System. The Service is also employing interns to examine its published documents for substantial references to landscapes. This effort has yielded 200 items out of 6,000 publications to date.

Catalog of Landscape Records in America.—This recently developed program, begun by the American Garden History Program at Wave Hill, Bronx, NY, will eventually result in a major catalog of landscape information (see box B).

Other Databases

A number of different private or university organizations maintain specialized databases related to landscapes. For example, landscape architect Robert Harvey of Iowa State University has developed a small database of his library of 700 books.[74] By putting in the tables of contents, and using keywords in a search it is possible to generate a variety of bibliographies dealing with different topics. The State of New Mexico, which has completed the first phase of its historic landscape survey, plans to place its entire list of historic landscapes on a database.[75]

Remote Sensing

Remote sensing[76] techniques, especially those used from the perspective of aircraft and spacecraft, hold great promise for the study of historic landscapes, because they are nondestructive and capable of analyzing vast areas quickly and accurately.[77] Those that provide a broad, overall (synoptic) view and record data in digital form for direct computer processing (e.g., multispectral scanners on spacecraft or aircraft), will eventually prove important for improving landscape discovery, identification, and evaluation. However, for most applications today, aerial photographs are extremely valuable and much cheaper than data from multispectral scanners.

Many of the older aerial photographs (from files of the U.S. Department of Agriculture's Soil Conservation Service, housed in the Cartographic and Architectural Branch of the National Archives and Record Administration, for example) may provide useful historical information on landscapes, but they have not been fully exploited. Aerial photographs, which have been taken of most places in the United States many times since the early 1930s, provide a unique record of changes in the landscape over time.[78] Not only can such photos serve to alert managers about impending changes or destruction of landscapes from natural or human causes, they can also point the way to understanding a variety of natural processes, such as erosion, or vegetation growth, that affect them. However, such photographs have seen relatively little use by the landscape preservation community.

Geographic Information Systems (GIS)

These are computerized database systems in which the data are explicitly spatial in nature and organization. A complete GIS includes both computer software and hardware. Such systems are designed to integrate, manipulate, and analyze statistical, demographic, cultural, and natural resources data. They also have the capability to print maps and reports containing a wide variety of information.

[74]Robert Harvey, personal communication, 1986.

[75]State of New Mexico, "First Annual Report, Registry of Historic Landscapes," Historic Preservation Bureau, 1982, p. 7.

[76]In general terms, remote sensing is the art of obtaining information about objects, areas, or phenomena through analyzing data gathered by devices placed at a distance from the subjects of study. Remote sensing may refer to sensing over short distances, as in medical or laboratory research applications using lasers, or over long distances as in environmental monitoring from spacecraft using advanced electro-optical instruments. Once the initial data are sensed, they must be analyzed and interpreted either visually or through sophisticated computer analysis.

[77]See OTA, *Technologies for Prehistoric and Historic Preservation*, op. cit., ch. 3, for a more complete exposition of remote sensing as it applies to preservation requirements. See also Carole L. Crumley and William H. Marquardt, *Regional Dynamics: A Landscape History of Burgundy* (New York, NY: Academic Press, in press). This book analyzes the historical landscape of Burgandy, France from an interdisciplinary perspective.

[78]James I. Ebert, Eileen L. Camilli, and LuAnn Wandsnider, "Measurement of Bank Erosion at Archaeological Sites on Middle Missouri River Reservoirs Using Sequential Aerial Photographs," presented at the 52d Annual Meeting of the Society for American Archaeology, Toronto, May 9, 1987.

Originally, geographic information systems were developed for large mainframe computers and used by Federal or State agencies for resource management analysis and planning. For example, the State of Mississippi has used its Mississippi Automated Resource Information System (MARIS) to conduct studies on nuclear waste disposal and storage, Mississippi Delta ground water, and statewide land cover.[79] More recently, the proliferation of powerful microcomputers and minicomputers has reduced the cost of such systems and made it possible for smaller organizations to acquire them.

In preservation, GIS have been employed in studies of historic settlement patterns. The Army, for example, has used existing GIS technologies to map vegetation, slopes, and archaeological sites across a landscape.[80] Its system can plot every known site.

Geographic information systems can also be used for identifying, mapping, and displaying landscapes.* Army technicians, for example, can show how the landscape looks at different times of the day or season. Although the Army uses such information for planning military exercises, and other strictly military purposes, most of these techniques could be transferred into the civilian realm. The Army Corps of Engineers has developed a GIS called the Geographical Resources Analysis Support System (GRASS), which can run on a minicomputer or microcomputer and has four major subsystems:

1. *Grid Cell Analysis System (GRASS-GRID)*: Provides tools for overlaying, analyzing, and displaying grid cell databases within an area.
2. *Image Processing (GRASS-IMAGERY)*: Processes and interprets Landsat digital images and digitized aerial photographs.
3. *Digitizing and Map Development (GRASS-MAPDEV)*: Converts printed maps into digital data for manipulation by other GRASS subsystems.
4. *Polygon Display and Analysis*: Produces maps for the plotter from the database.[81]

[79] U. S. Congress, Office of Technology Assessment, *Remote Sensing and the Private Sector: Issues for Discussion—A Technical Memorandum* (OTA-TM-ISC-20) (Springfield, VA: National Technical Information Service, March 1984), app. C.

[80] Constance Ramm-2, U. S. Department of the Army, personal communication, 1986.

*John Knoerl, "Managing Historic Preservation Information," presented at the 52d Annual Meeting of the Society for American Archaeology, Toronto, May 9, 1987.

[81] J. Westervelt, W. Goran, and M. Shapiro, "Development and Applications of GRASS: The Geographical Resources Analysis Support System," in Bruce K. Opitz (ed.), *Geographic Information Systems in Government* (Hampton, VA: A. Deepak Publishing, 1986), pp. 605-624. This book contains a comprehensive review of the many uses of GIS for land analysis and management.

LANDSCAPES AND A CENTER FOR PRESERVATION TECHNOLOGY

If an institution intended to focus on the study and development of technology for preservation problems, such as a Center for Preservation Technology, is eventually established, part of its agenda will be landscape preservation. Like the study and preservation of archaeological sites and historic structures, landscape preservation requires the mutual support and interaction of experts in many disciplines. The center should include specialists from several different disciplines, including but not limited to, agronomy, botany, cultural geography, geography, horticulture, landscape architecture, soil sciences, and zoology.

The following sections suggest some of the landscape problems a multidisciplinary center might tackle.

Intensive Regional Survey of Landscapes

No organization has made an intensive local or regional landscape survey. Yet such a survey, carried out in several well-defined small regions, would have numerous benefits for preservation, as well as local and regional planning efforts. It could:

- serve as a model for identifying historic landscapes in other regions;
- demonstrate the use and value of GIS and other technologies in identifying and surveying significant landscapes;
- assist landscape management and maintenance planning;
- assist natural resource inventory and planning;
- demonstrate the ability of GIS to map the projected alterations in the landscape as a result of a proposed change in land use policies; and
- assist in managing trade-offs with other uses of the landscapes.

In addition, an intensive regional survey would help educate preservationists in learning how to identify, characterize, analyze, evaluate, and manage landscapes.

Such a survey should be multidisciplinary and use all the available tools of landscape survey, including existing maps and GIS, to investigate a region in detail. The survey should include all major structural elements and archaeological sites, as well as contemporary landscapes and landscape uses. It would serve as a model for identifying historic landscapes and showing how their preservation and management might be integrated with other uses of the landscape.

The State of Maryland, because of its highly varied landscape and its experience with broad-based surveys of historic structures, might prove an excellent place to conduct an intensive regional survey. Box C outlines what such a survey might entail.

Horticultural or Botanical Technologies

Authentic restoration and conservation of historic landscapes depends on the ability to identify, locate, and use plants appropriate to the historical period of interest. Landscape restorers and managers need inventories of plants grown in a region or area at different periods of history, and sources from which those plants may be obtained. In turn, the restored landscapes themselves can become an important repository for historic species and thereby assist the maintenance of biological diversity within the United States. Living history museums and historic farms may also provide the means to save historic plant stock for future generations. Organizations such as Seed Savers and North American Fruit Explorers also assist in this effort, and may be an important source of seeds for historic plant varieties.[82]

The United States is losing important collections of historic plant materials. Yet we often are not fully aware of which plants growing today in historic landscapes are authentic historic materials. England has met such problems in part by insisting that historic gardens and other historic

[82]See OTA's background papers entitled *Grassroots Conservation of Biological Diversity in the United States*, Background Paper #1, OTA-BP-F-38 (Washington, DC: U.S. Government Printing Office, February 1986); and *Assessing Biological Diversity in the United States: Data Considerations*, Background Paper #2, OTA-BP-F-39 (Washington, DC: U.S. Government Printing Office, March 1986), for a discussion of biological diversity.

Box C.—Intensive Survey of Prehistoric and Historic Landscape Resources in Maryland

Since 1961, the Maryland Historical Trust has conducted an organized, directed survey program to locate, identify, record, and protect significant cultural resources throughout the State. As the survey program has matured, the Trust has placed increasing emphasis on intensive, comprehensive regional survey projects and on expanding its survey efforts to include thematic resource types. The State survey program now includes intensive architectural coverage for 20 of the 23 Maryland counties, and archaeological management plans for four of the five major regions in the State.

Thematic studies have included:

- 3-year survey of industrial sites in Baltimore;
- survey and thematic National Register nominations for traditional sailing craft of the Chesapeake Bay;
- pilot study of agricultural buildings in the Tidewater Region; and
- 3-year survey of Maryland's underwater archaeological resources.

Concurrently, the Trust has undertaken a concerted program to develop new research methods, computerized modeling, and remote sensing techniques, which will expand the capabilities of the Trust's overall program and allow increased understanding of the historic landscape. Recently the Trust has completed the development of the Maryland Comprehensive Historic Preservation Plan, which will serve as a blueprint for Maryland's preservation planning and cultural resource management.

These efforts have laid the groundwork for an intensive pilot study of Maryland historic landscapes. Such a study would allow a more comprehensive view of the State's cultural resources and promote links between traditional cultural resource management and environmental planning and management.

A study of historic landscapes should consider several major categories of resource type:

- Natural landforms that reflect significant events in the formation of the present landscape. Particular emphasis should be placed on landforms and resource types that have directly affected prehistoric and historic settlement patterns. For example, an intensive landscapes study could:
  - —investigate the linkage between prehistoric settlement patterns and access to lithic sources, environmental transition zones, and favorable soil types and landforms; and
  - —study shifting patterns of site selection in the historic period, contrasting early colonial preference for estuarine sites with later colonial and post-colonial preferences for river terrace sites also used in prehistoric times.
- Designed and cultural landscapes that can be directly linked to conscious efforts to manipulate landforms, plant materials, and the built environment. The following steps could be taken:
  - —analyze selected town squares, public spaces, and urban park systems;
  - —study selected planned communities such as Roland Park, Perryville, Greenbelt, Columbia;
  - —locate and evaluate individual sites with landscape significance, such as David Fairchild's "In the Woods," and the numerous projects by Olmsted and his firm.
- Incidental landscape features that are the result of settlement patterns, agricultural practices, industrial development, transportation systems, and resource exploitation. It would:
  - —evaluate a variety of ways in which the railroads influenced settlement patterns and industrial exploitation, possibly using the role of the B&O Railroad in the development of western Maryland for both industry and tourism, resulting in towns as varied as Mt. Savage, and Mountain Lake Park; and
  - —explore other transportation developments, such as the C&O Canal, the suburban street car lines serving Baltimore and Washington (including early black suburbs in Prince George's County, and the construction of key highways such as U.S. Route 1, the Baltimore-Washington Expressway, and Interstate 270.

In order to allow comparison of the study of these categories, an intensive survey should be conducted in study areas that have distinctly different environments. In Maryland, it would be possible to select four such study areas:

1. an Eastern Shore region, to reflect rural agricultural development in the generally flat Chesapeake Tidewater;
2. Baltimore city, to reflect intensive urban development;
3. the Piedmont west of Baltimore, to allow comparison of an upland agricultural and small town environment with the Tidewater; and
4. the western Maryland valley and plateau, to reflect a mixture of agriculture and timber and mineral resource extraction, and transportation exploitation in the Appalachians.

After completion, such a pilot study should develop recommendations for the identification, survey, and evaluation of prehistoric and historic landscape features throughout the United States, as well as the State of Maryland. In addition, the study could also be used for the protection and management of significant landscape resources.

In addition to providing information for effective management of these cultural resources, the results of the study could also be used to educate local residents about the historic importance of such resources. It may be appropriate to mount an exhibit such as the recent show, New Jersey Pinelands: Tradition and Environment, which featured exhibits that demonstrated how the inhabitants of the Pinelands have interacted with the land through history.[1]

[1]Produced at the New Jersey State Museum, Trenton, NJ.

SOURCE: Maryland Historical Trust.

landscapes be replanted using historic species, even if it means that the landscape managers may have to defer certain plantings because plant stock is unavailable at the time they wish to plant.

Although many species may still remain in private collections, and smaller commercial nurseries, there is inadequate knowledge of what exists, and little control over the disposition of such stock. A center for preservation technology could serve as a central clearinghouse for historical horticultural and botanical information. If the center also maintained a computer-accessible database containing such information, it could also increase the Nation's ability to restore, conserve, and maintain historic landscapes.

It may also be necessary to establish regional arboreta designed specifically to save, nurture, and propagate historic species. Because of the regional nature of plant hardiness and adaptability, such arboretums would have to be regional in scope. Sleepy Hollow Restorations, in New York, has already started searching out and growing historic plants; Monticello, in Virginia, has opened The Thomas Jefferson Center for Historic Plants in 1987. The Thomas Jefferson Center will build and maintain a collection of historic plants; sell plants; educate the public through publications, interpretive gardens, lectures, and conferences; and study and document the history of plants used in America.[83]

Clearinghouse for Landscape Preservation Information

The preservation of historic cultural resources, including landscapes, depends substantially on the use of historical records and technical information that exist in a variety of forms and are stored and maintained in many different places. Decisions concerning the restoration and main-

[83]"Many historic varieties have desirable characteristics such as fragrance, flavor, vigor, or disease resistance, which may be needed in future plant breeding. The Center is also collecting the species forms from which modern strains have been developed, and choice North American plants, a group of special interest to Jefferson himself."—Monticello Promotional Brochure, 1987.

tenance of historic landscapes are highly dependent on historical maps and landscape plans. The Library of Congress, The National Archives and Records Administration, The National Park Service, The Smithsonian Institution, The National Technical Information Service, and other Federal, State, and local agencies acquire and maintain a wide variety of information on historic landscapes, including information on plant and tree varieties.

Although other agencies are responsible for carrying out research on archival technologies, the staff of a center ought to be familiar with the latest means of storing, maintaining, conserving, and disseminating information. In addition, the center should maintain a central database that lists the primary landscape databases around the world.

The preservation community also needs information on preservation technologies and sources of expertise, delivered expeditiously. One of the most important needs related to technology is for critically evaluated information on the conservation, restoration, and maintenance of historic landscapes. A centrally maintained technical database could provide such information. Among other things, such a database could strengthen communication among preservation professionals and their counterparts in natural science and engineering fields. Here again, it would also be important to create a centralized database that provides listings of specialized databases that might be held elsewhere. Such a database should be made useful and accessible to developers, planners, researchers, and others outside the professional preservation community. To be of greatest use, it should be made available "online," and routinely updated.

Landscape Management and Maintenance Techniques

Preservation and management decisions are influenced by two broad considerations. First, at the level of the site, structure, or landscape, cultural resource professionals must generally decide how the landscape will be preserved, used, and interpreted to the public *before* beginning excavation or restoration. At a broader level, managers charged with stewardship of our cultural resources must consider the various goals of preservation and choose appropriate technologies accordingly. Is preservation for future research, for public examination and appreciation, or is it to satisfy certain legal requirements? These considerations will then affect the management of the landscapes and the expenditure of funds.

Restoration of a designed landscape often involves rehabilitation or restoration of existing elements, for example, pruning and rejuvenation of trees and bushes, dredging of ponds, reconstruction of bridges and walks. It is frequently difficult to find workers who are adequately trained to do such work to the standards required in historic settings. Many of these historic skills have been lost. A Center for Preservation Technology could work with other organizations, such as RESTORE, in New York,[84] to integrate historic skills, which are generally labor-intensive, with new technologies that could reduce the amount of labor required.

For example, the increased use of personal computers and specially designed software could be extremely helpful in improving the quality and quantity of maintenance planning and management. A computerized management plan for a landscape would allow landscape managers to factor in a number of tasks on a cyclical basis. Each different species of tree, shrub, and plant, as well as structures such as bridges, pavilions, and interpretive centers require a different individual treatment or maintenance strategy, but the computer can simplify the complexities of allowing for such differences. It allows computation of needed labor resources based on assumptions about maintenance standards and landscape systems, and provides the capacity to match up such needs with available labor. It also enables managers to develop a schedule for maintenance that takes into account the level of education and skills of the maintenance personnel and could help justify additional training or personnel, if needed.

[84]RESTORE is a New York-based nonprofit organization that provides training for tradespeople in the restoration and maintenance of historic buildings.

Finally, a center could investigate technologies for such problems as reducing erosion and stabilizing landscapes. Erosion, whether it occurs from overflowing streams, or wave action, the variation in water level of reservoirs, or surface flow over denuded slopes, is one of the most serious natural threats to landscapes, as well as to archaeological sites. As has been noted elsewhere, "the methods available for archaeological site stabilization differ very little from those which have been used for streambank maintenance and general erosion control."[85] Little comparative research has been carried out on the use of such methods. The following materials and methods, among others such as the use of seawalls, have been employed with varying success for site stabilization:[86]

- stone riprap,
- concrete pavement,
- gunite,
- used-tire mattresses,
- groundcover planting,
- driftwood facing,
- sandbags,
- woven fiberglass or woven excelsior matting,
- GEOWEB,
- soil-binding polymers,
- tall-grass meadows, and
- vegetation around underwater sites.

Although many of the above methods would be unsuitable for the long-term preservation of certain historic landscape features, the use of temporary methods such as the emplacement of certain forms of woven fabric, the use of tire mattresses, or fencing, might be appropriate in some locations until vegetation growth is resumed.

[85]Robert M. Thorne, "Preservation is a Use . . . : Experimental Archaeological Site Stabilization in the Tennessee Valley," *Tennessee Valley Authority Publications in Anthropology* 40, 1985.

[86]Ibid.; U.S. National Park Service, "Earthworks Management Manual," Mid-Atlantic Regional Office (Philadelphia, PA: May 1987).

Public Education

One of the most important functions a Center for Preservation Technology could have is the translation of research results into information the public can comprehend and use. Although nearly all of the effort of a center would be directed toward providing technological support for the professional preservation community, many of the techniques developed would be of general interest and application. A center could include, as part of its publication program, a series that focused on methods of identifying, inventorying, evaluating, conserving, and restoring landscapes. Many of these methods would be of considerable interest to those who manage contemporary landscapes.

For example, a videodisk that presented the restoration of a designed landscape, including discussions of design decisions, organization of paths, shaded areas, historic reference materials, physical features, etc., could be of considerable interest to the public and also teach people how to care for their own properties.

Traveling museum exhibits, television documentaries, and interpretive packages for teachers would serve to educate the public concerning preservation values and impart significant technical information concerning landscapes.

FEDERAL POLICY TOWARD LANDSCAPE PRESERVATION

The Federal Government is responsible for providing leadership in preserving the Nation's prehistoric and historic cultural resources.

The Role of the National Park Service

The National Park Service serves as the lead agency for technical preservation matters for the Federal Government, and for State and local efforts. In order to improve the preservation of prehistoric and historic landscapes, it would be necessary for the National Park Service to focus more consistent attention on landscape preservation in its management of cultural resources, and coordinate landscape policies and programs with other agencies. For example, although NPS has a chief historian, a chief archaeologist, a chief curator, and a chief historical architect, it has no chief landscape architect. To assist in meeting prehistoric and historic landscape preservation goals, the National Park Service has identified 12 projects for standards and models. In focusing increased attention to historic landscapes, NPS could also emphasize the role of technologies in preserving prehistoric and historic landscapes.

In addition, the National Park Service is now considering how to preserve its own historic landscapes; it could intensify those efforts by singling out several landscapes to serve as preservation models for other agencies and for State and local efforts.[87] In the past, NPS has directed relatively few of its resources toward landscape preservation, compared to preservation of historic structures or archaeological sites. It could redress part of this imbalance by directing a greater portion of cultural resource funding toward landscape preservation. NPS managers need to be more aware of the value of preserving historic landscapes.

NPS could assist in this effort by making a greater effort to include consideration of prehistoric and historic landscapes in their various publications. For example, the *Preservation Briefs* and *Tech Notes*, published by the NPS Preservation Assistance Division, now focus on the preservation of historic structures. The subject matter of these and other publications could be expanded to include recommendations on preserving landscapes. NPS could also exercise leadership and enhance its own landscape preservation effort by upgrading and highlighting the function of gardening and grounds maintenance as a crucial resource management role in the service. Finally, NPS could develop a self-study course similar to the one NPS developed for historic architecture.[88] This course is directed at a range of job classifications, and depending on previous knowledge and interest the employee could either update or increase his or her preservation skills.

Uniform standards for landscape identification and preservation need to be developed. NPS publications, *National Register of Historic Places Bulletin* 18, "How To Evaluate and Nominate Designed Historic Landscapes," and the NPS Handbook, "Cultural Landscapes: Rural Historic Districts in the National Park System,"[89] will assist the effort to develop standards for nomination to the National Register of Historic Places. However, technical standards equivalent to those that have been generated for the built environment are also important and must be developed for landscapes.

The National Historic Preservation Act

Although the National Historic Preservation Act contains no impediment to the identification and preservation of landscapes, neither does it specifically mention them.[90] Yet, most Federal agencies that hold and manage historic properties also

[*]U.S. Congress, Office of Technology Assessment, *Technologies for Prehistoric and Historic Preservation*, OTA-E-319 (Washington, DC: U.S. Government Printing Office, September 1986), app. F.

[87]See for example, John Donahue, "Historic Landscaping," *National Park Service CRM Bulletin*, vol. 9, No. 2, 1986, pp. 1,8, which mentions briefly both landscape design considerations and technologies for reproducing historic trees.

[88]Hugh C. Miller, Lee H. Nelson, and Emogene A. Bevitt, "Skills Development Plans for Historical Architects in the National Park Service" (Washington, DC: National Park Service, May 1986); NPS gave a course entitled "Policies and Issues in Preservation of Historic Landscapes," Fredericksburg, VA, April 1986.

[89]This publication will soon be published in a revised edition.

[90]For example, see Sec. 101 (a)(1)(A): "The Secretary of the Interior is authorized to expand and maintain a National Register of Historic Places composed of districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, engineering, and culture."

manage prehistoric or historic landscapes. Not expressly naming historic landscapes as worthy of being identified and preserved allows the agencies to overlook landscape concerns in their preservation programs.

Many have suggested that it may be appropriate to amend the National Historic Preservation Act to include explicit reference to historic landscapes. Others have expressed concern that including explicit reference to historic landscapes will open the act to inclusion of other, more specific historic categories, or will subject it to unnecessary and harmful experimentation.

Terminology

The Federal Government could aid in the identification and preservation of significant prehistoric and historic landscapes by clarifying landscape terminology in the National Register, improving interagency information flow concerning historic landscapes, and focusing more attention on landscape preservation.

As noted in Issue A, the lack of consistent terminology constitutes a formidable barrier to identifying and preserving significant historic landscapes. In an effort to bring consistency to landscape preservation, the Historic Preservation Committee of the American Society of Landscape Architects has proposed landscape preservation terminology.[91] This, and other similar efforts, should be examined carefully and consistent terminology developed and promulgated. However, such terminology should be clear and appropriately reflect the interests of a variety of disciplines that investigate landscapes. In other words, it should not be biased toward the thinking of any one professional group or discipline. In order to assist the procedure of nominating significant prehistoric and historic landscapes to the Register, it may be appropriate to include landscape terminology in the National Register categories as well as in guidelines developed for evaluating and nominating them.

[91]Patricia O'Donnell, "Proposed Landscape Preservation Definitions," ASLA Committee on Historic Preservation, 1984.

National Survey of Prehistoric and Historic Landscapes

As noted previously, in 1984, with the support of NPS, the Historic Preservation Committee of the American Society of Landscape Architects (ASLA) began a national survey of designed historic landscapes. This project exemplifies the importance of the public/private partnership to historic preservation. The survey is being conducted through the ASLA, primarily by volunteers from many regions of the United States. The quality and completeness of the results therefore vary depending on the interest, degree of expertise, and available time of those volunteers. New Mexico has completed an initial comprehensive survey. Massachusetts has inventoried its Olmsted Parks and has established an office that is responsible for preservation of historic landscapes. Most other States have only just begun their surveys.

NPS could assume a stronger role in the survey effort, in order to assure timely completion of the survey and to standardize the information collected. Congressional oversight may be necessary to assure completion of this important project.

As noted in Issue C, too few U.S. landscapes have been inventoried to provide significant examples. An interdisciplinary team approach, in which anthropologists, archaeologists, architects, cultural geographers, and historians work together with landscape architects in conducting a broad-based survey of American landscapes, could result in a dramatic increase in the quantity and quality of documented historic landscapes.[92]

The proliferation of microcomputers and minicomputers may improve the information flow among agencies. However, the lack of common standards for maintenance of databases among the agencies constitute a formidable barrier to achieving a national inventory of historic landscapes.[93] Although the agencies are taking

[92]*Olmsted Historic Landscape Preservation Program: Guidelines and Criteria for Implementation* (Boston, MA: Commonwealth of Massachusetts Office of Environmental Affairs, April 1985).

[93]OTA, *Technologies for Prehistoric and Historic Preservation*, op. cit. ch. 5.

steps to coordinate databases, it is not clear how successful such coordination will be. Such coordination would greatly improve the efficiency of maintaining current information.

Olmsted Heritage Landscapes Act

It is crucial to increase public awareness of the value of significant historic landscapes if they are to be preserved. By focusing attention on the many landscape projects designed by Frederick Law Olmsted and his professional successors,[94] passage of the Olmsted Heritage Landscapes Act of 1987 (H.R. 17), an earlier version of which was introduced in the 99th Congress,[95] could materially aid the collection of information on all U.S.-designed historic landscapes. Among other things, the bill directs the Secretary of the Interior:

- to direct the National Park Service, with the assistance of other Federal agencies, State and local officials, and other interested parties, to prepare an inventory of all Olmsted heritage landscapes consisting of "a listing of all Olmsted heritage landscapes . . . and a technical evaluation of all publicly owned Olmsted heritage landscapes, and of all Olmsted heritage landscapes on or eligible for inclusion on the National Register of Historic Places;
- "in consultation with the Advisory Council on Historic Preservation, [to] promulgate . . . guidelines for applying the Secretary's Standards for Historic Preservation Projects to historic designed landscapes;
- "provide technical assistance to other Federal agencies, State and local governments, private organizations and interested individuals, on the identification, commemoration, and preservation of historic designed landscapes;
- "conduct and submit to the Congress . . . a thematic study of historic designed landscapes . . . which would qualify as national historic landmarks;
- "encourage a compatible program for the use of the Frederick Law Olmsted National Historic Site, Brookline, Massachusetts, as a center for research, fellowships, and related activities."

In the debate over H.R. 37 in the 99th Congress, some private owners of Olmsted properties expressed fear that passage of the Olmsted Act would have limited their ability to control disposition of these properties, and to develop them if desired.[96] However, H.R. 37 contained no provisions limiting their right to do so. The bill primarily sought to inventory Olmsted properties. Nevertheless, opponents were concerned that drawing attention to the historic nature of Olmsted properties would strengthen the hand of preservationists in opposing future development.

Having passed the House in June 1985, the bill was referred to the Senate, where it was amended and reported favorably by the Senate Committee on Energy and Natural Resources. Although the House accepted the Senate's amendments, the bill eventually failed to pass the Senate in the closing hours of the 99th Congress. H.R. 17, as introduced, is equivalent to the previous bill and contains the few amendments agreed to in the 99th Congress for H.R. 37 (included in the 99th Congress Senate version—S. 2091). It was referred to the Subcommittee on National Parks and Public Lands on February 5, 1987.

Center for Preservation Technology

The Department of the Interior, which through NPS provides technical preservation assistance to Federal, State, and local agencies, could be directed to examine the benefits and drawbacks of a Center for Preservation Technology, and prepare a report on what such a center might contribute to the effort to develop cost-effective techniques, methods, and equipment for preservation, including landscape preservation. The Department of the Interior might choose several technologies or technology areas and explore

[94]Over three generations, the Olmsted firm, whose Brookline, MA, office is now a National Historic Site, managed by NPS, designed such parks as Central Park in New York City; Franklin Park in Boston, MA; and Prospect Park in Brooklyn, NY.

[95]H.R. 37—see House of Representatives Committee on Interior and Insular Affairs Report 99-148, 99th Cong., 1st sess.

[96]"Hospital Challenges Preservationists on Bill To Catalogue Olmsted Designs," *New York Times*, Jan. 27, 1986.

how such a center could support the Department's current and projected needs for preservation technology.

For example, remote sensing technologies, including spaceborne, airborne, and ground-penetrating sensors, have demonstrated their effectiveness for a variety of tasks related to the identification and analysis of prehistoric and historic cultural resources.[97] Airborne or spaceborne remote sensing instruments are especially useful in detecting variations of vegetation type over an area. However, the effectiveness of different remote sensing methods varies according to type of cultural resource and the conditions under which they are used.[98] A study by the Department of the Interior could assess the ability of a center for preservation technology to address the needs of the Department and other Federal agencies for support of advances in remote sensing technologies.

Education and Interpretation

Public education is an extremely important component of the preservation process, as most funding for historic preservation projects derives from the public, either through donations, taxes, or through entrance fees. In addition, public support and advocacy are needed to support inclusion and expansion of funds for historic preservation in Federal appropriations, which support historic preservation efforts in various Federal agencies, the National Trust for Historic Preservation, and State grants administered by the SHPOs. Public education and research seek to answer the question: what can we learn from the past, as revealed in our material prehistory and history? Because the information conveyed by public education is directly tied to what we learn from the study of archaeological sites and historic structures and landscapes, and should be of the highest quality, preservation professionals have a responsibility to report their research findings to the public as well as to colleagues at professional meetings and in published articles.

Historic cultural sites, buildings, and landscapes are milestones in our Nation's history. Public education is most effective when it helps the public understand and experience prehistoric and historic sites, structures, and landscapes in relation to cultural and political history. In representing events, people, and styles of life that affected or helped form our current values and beliefs, it evokes an understanding of our relationship to the past; it makes history live.

Accessible, clearly presented information about historic landscapes can help the public to understand, for example, that even a designed landscape may reflect broad economic, political, and social values, as well as the personal aesthetic values of its designer or patron. Information about prehistoric landscape sites can make the public more aware of the cultural and scientific achievements of Native Americans.[99]

Among Federal agencies, the National Park Service (NPS) has a long history of public education concerning cultural resources, which grew out of its interest in interpreting natural settings and values to its park visitors.[100] Other agencies, such as the Bureau of Land Management[101] and the U.S. Forest Service also maintain interpretive staffs and develop interpretive materials. NPS sees cultural resource management and interpretation as complementary. "Interpretation communicates the significance and value of the resource to . . . 'the public'."[102] Interpretation also assists in "developing support for preserving" the parks' resources, including cultural resources.[103] "The

[97]Thomas Sever and James Weisman, "Remote Sensing and Archaeology: Potential for the Future," National Aeronautics and Space Administration, Earth Resources Laboratory, January 1985.

[98]*Technologies for Prehistoric and Historic Technology*, op. cit., ch. 3.

[99]See, for example, Ray A. Williamson, *Living the Sky: The Cosmos of the American Indian* (Boston, MA: Houghton Mifflin, 1984), for an extensive discussion of prehistoric structures and landforms that display evidence of Native American knowledge of the motions of the celestial sphere.

[100]Barry Mackintosh, *Interpretation in the National Park Service: A Historical Perspective* (Washington, DC: U.S. Department of the Interior, National Park Service, 1986).

[101]For example, the Western Regional Office of the Bureau of Land Management maintains a Cultural Resources Series that presents material both to professionals and laymen on the cultural resources of the region.

[102]*Cultural Resources Management* (Washington, DC: U.S. Department of the Interior, National Park Service, NPS-28), ch. 3, p. 34, August 1985. See also *Interpretation and Visitor Services Guideline* (Washington, DC: U.S. Department of the Interior, National Park Service, NPS-6, August 1985).

[103]"The Role and Responsibility of Interpretation in the National Park Service," position paper attached to Memorandum from William Penn Mott, Jr., NPS Director, to NPS Regional Directors regarding Interpretation, Feb. 10, 1986.

preservation of the tangible evidence of this [our] past insures the preservation of the knowledge base. [It is] a base that can help us understand the fundamental relationships of men to each other and of men living in communities to their environment as a whole."[104] Research results are an important part of the significance and value of cultural resources, and often form a part of NPS interpretive presentations.

The Federal Government, especially NPS, could enhance the public's understanding and importance of prehistoric and historic landscapes by including interpretive material on landscapes in the presentations park rangers give to the millions of park visitors each year. However, this would require NPS to develop additional interpretive materials.

Guidance to States

One of the most important functions the Federal agencies can serve with respect to prehistoric and historic preservation is to provide training to State and local preservation agencies and groups. As noted below in the section on *State and Local Landscape Preservation*, the States could benefit from access to information on carrying out landscape surveys. In addition, the extensive Federal experience with designing and using various kinds of databases would benefit the State Historic Preservation Offices.

Tax Incentives

Tax incentives have provided an incalculable boost to preservation of historic structures. One tangible way of imparting value to the preservation of historic landscapes would be to allow tax credits and incentives for their preservation and restoration. Current legislation permits historic preservation tax credits for buildings only. Participants suggested that local governments be encouraged to use combinations of zoning, scenic/historic easements, and property tax incentives to encourage landscape preservation, whether independent of historic structures or in conjunction with them.

[104]Ibid., p. 8.

STATE AND LOCAL LANDSCAPE PRESERVATION

From the beginning of the preservation movement, State and local governments, along with private organizations and many individuals, have provided the support and the incentive for preserving significant aspects of this Nation's history. Local residents wish to have a strong hand in preserving their own history. Under the terms of the National Historic Preservation Act, States are responsible, through the State Historic Preservation Offices, for a wide variety of preservation activities, including landscape preservation. Although the technical guidance and support of the Federal Government can assist States' efforts to make more effective use of technology for landscape preservation, ultimately the impetus must come from within the States.

The States' approaches to landscape issues are very uneven. As noted earlier, only Ohio, Massachusetts, and New Mexico have made significant strides in the identification of landscapes. However, except for New Mexico, which maintains a registry of historic landscapes (box D),[105] their efforts are related to specific, discrete projects. If the States are to have a wider role in preserving prehistoric and historic landscapes, such landscape surveys should be institutionalized, and broadened to include all possible classes of prehistoric and historic cultural landscapes.

Part of the problem is that few of the SHPOs have staff with expertise in historic landscapes; as a result, the SHPOs are less apt to understand and appreciate historic landscape issues. State offices should be encouraged to maintain surveys on computer databases so they can be enlarged and corrected frequently and cost effectively.[106] For example, as mentioned earlier, the State of New Mexico plans to put its Registry of Historic Landscapes on a computer database.[107] A yearly report to the State legislature detailing that year's efforts might assist in obtaining additional support for statewide work.

Landscape surveys designed to gather information through interviews with local residents would have the salutary effect of making them aware of the value of landscapes and landscape preservation. It would also involve them in the survey process.

The Olmsted Historic Landscape Preservation Program of the Commonwealth of Massachusetts provides one model for a statewide landscape preservation initiative. It authorizes $15 million for historical research planning, and capital improvements for 12 municipally owned parks across Massachusetts. The program has developed innovative funding sources and has involved the local communities in the process of thinking about landscape preservation. Early inventory efforts by the Massachusetts Association for Olmsted Parks, a non-profit organization, served as a catalyst for this initiative.[108]

Creating awareness of the importance of historic properties within local communities is an important part of public education about preservation. In addition to providing information to the news media, managers of historic properties may find it beneficial to provide public lectures and other events for the local population either at the historic site or in the community.[109] Such activities are most effective if the local community is involved in planning and setting goals for the management and interpretation of the properties. Obtaining support of the local community, and involving them in setting project goals, are important aspects of public education. The local community then develops a sense of contributing to preserving the resource.

[105]State of New Mexico, op. cit.

[106]See OTA, *Technologies for Prehistoric and Historic Preservation*, op. cit., "Ch. 5: Preservation Information," for a discussion of State preservation databases.

[107]State of New Mexico, op. cit., p. 7.

[108]Sharv Page Berg, personal communication, 1987.

[109]For example, Sunnyside, in New York State, sends its interpretive staff into the local community to make citizens aware of their local history.

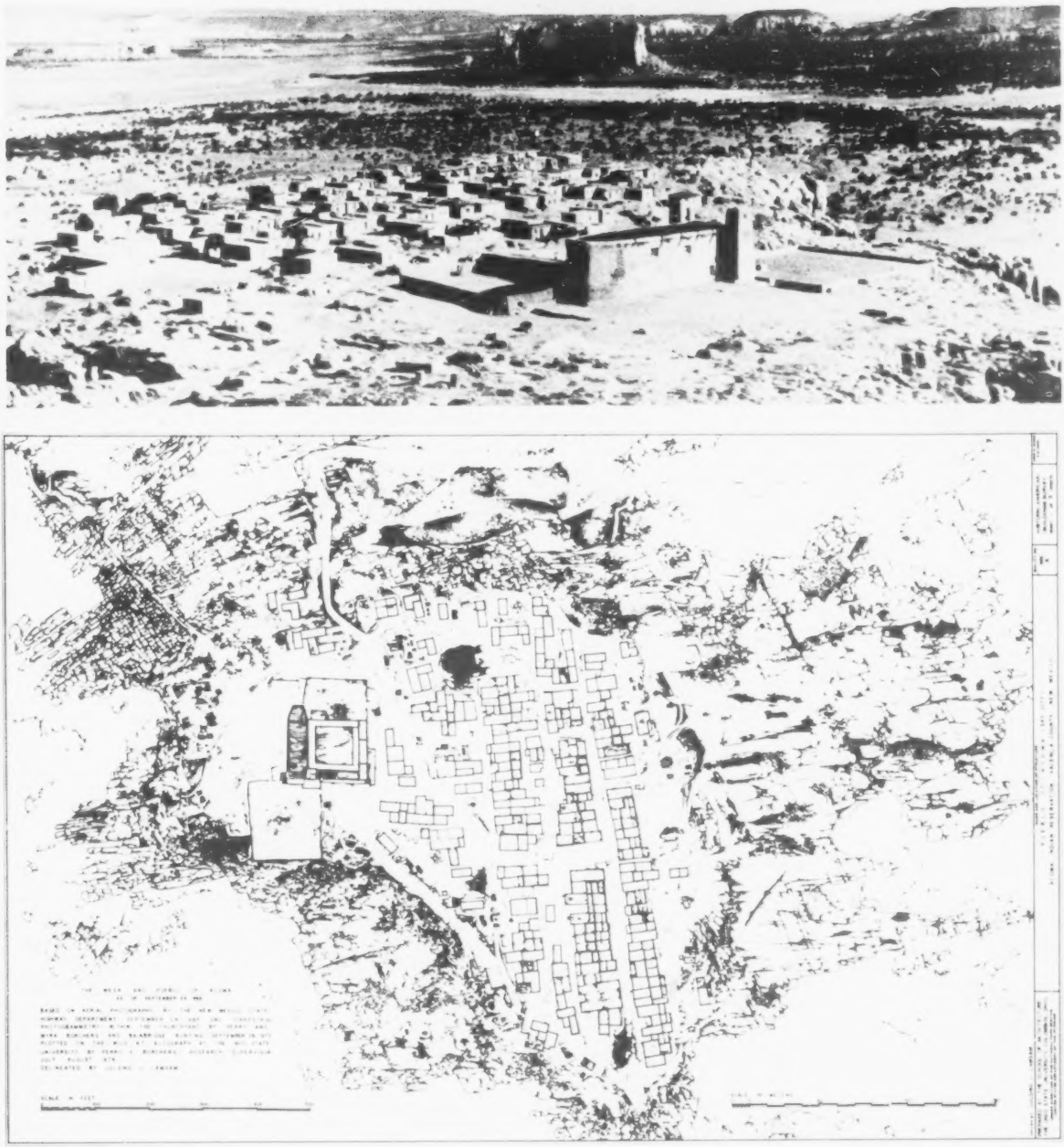


Photo credit: National Park Service, National Register of Historic Places

Acoma Pueblo, New Mexico. Aerial photograph and photogrammetric drawing prepared from stereo aerial photography for the Historic American Buildings Survey, National Park Service.

Box D.—New Mexico Registry of Historic Landscapes

Index to Categories:

A. Courtyards/Patios
B. Garden Houses
C. Plazas
D. Squares
E. School Campuses
F. Parterre Gardens
G. Arcades (including stagestops)
H. Parks
I. Arbors
J. Fountains/Spas
K. Campgrounds
L. Grounds of Public, Institutional, and Commercial Buildings
M. Outdoor Restaurants
N. Home Gardens
O. Streetside Walkways and Plantings
P. Cemeteries and Religious Institutions/Structures
Q. Arboreta and Botanical Gardens
R. Estates
S. City of Community Planning; Greenbelts
T. Playfields, Playgrounds, and Other Recreational Areas
U. Miscellaneous (parade grounds, fortifications, orchards, sculptures, calendars)

Types of New Mexico Landscapes:

1. **The "Frontier Pastoral" Landscape:** Exterior grounds of the Big House at Philmont Ranch.
2. **The Territorial Landscape:** Kit Carson's House at Rayado.
3. **The Route 66 Landscape:** El Rancho Hotel and grounds, Gallup.
4. **The Courthouse Square:** Many still preserved and used in many counties—Luna, Lea, Santa Fe, and Grant, among others.
5. **The New Deal Landscape:** Roosevelt Park, Albuquerque; Carrie Tingley Hospital, Truth or Consequences.
6. **The Vignette Courtyard or Patio:** Hacienda de Baca, Bernalillo; Sena Plaza, Santa Fe.
7. **The Great Plaza:** Most Indian pueblos, Spanish Colonial, and Mexican period towns.
8. **The River Landscape:** Continuity of form and function in the historic landscapes built along New Mexico's streams and rivers.

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